USDA United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with Michigan Department of Agriculture, Michigan Agricultural Experiment Station, Michigan State University Extension, and Michigan Technological University

Soil Survey of Iosco County, Michigan

How to Use This Soil Survey

General Soil Map

The general soil map, which is a color map, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

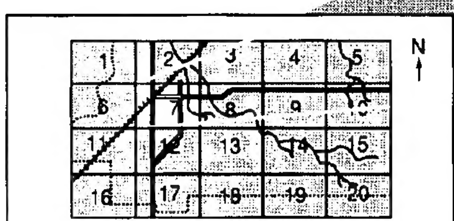
Detailed Soil Maps

The detailed soil maps can be useful in planning the use and management of small areas.

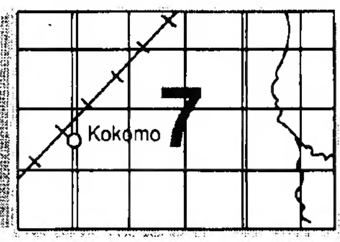
To find information about your area of interest, locate that area on the **Index to Map Sheets**. Note the number of the map sheet and turn to that sheet.

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Contents**, which lists the map units by symbol and name and shows the page where each map unit is described.

The **Contents** shows which table has data on a specific land use for each detailed soil map unit. Also see the **Contents** for sections of this publication that may address your specific needs.



INDEX TO MAP SHEETS



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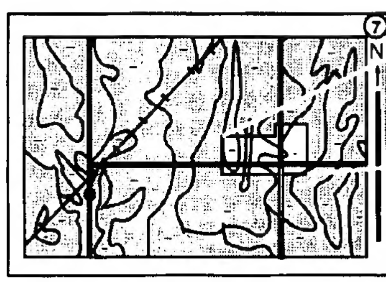

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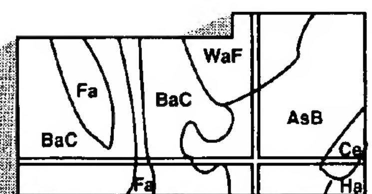

AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations and the Michigan Department of Agriculture, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1994. Soil names and descriptions were approved in 1995. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1994. This survey was made cooperatively by the Natural Resources Conservation Service and the Forest Service, the Michigan Department of Agriculture, the Michigan Agricultural Experiment Station, Michigan State University Extension, and Michigan Technological University. The survey is part of the technical assistance furnished to the Iosco County Board of Commissioners and the Iosco County Soil and Water Conservation District. The Iosco County Board of Commissioners provided financial assistance.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: The Tawas Point Lighthouse is maintained by the U.S. Coast Guard.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service home page on the World Wide Web. The address is http://www.nrcs.usda.gov (click on "Technical Resources").

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Foreword

This soil survey contains information that affects land use planning in Iosco County. It contains predictions of soil behavior for selected land uses. The survey also highlights soil limitations, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations that affect various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Ronald L. Williams
State Conservationist
Natural Resources Conservation Service

Soil Survey of
Iosco County, Michigan

By Erik P. Johnson, Michigan Department of Agriculture

Fieldwork by Richard W. Neilson and Jonathon D. Reedstrom, Natural Resources Conservation Service; Erik P. Johnson, Michigan Department of Agriculture; and Ramez A. Mahjoory, Bud Hart, and Joseph Gates, Forest Service

United States Department of Agriculture, Natural Resources Conservation Service,
in cooperation with
Michigan Department of Agriculture; Michigan Agricultural Experiment Station; Michigan Technological University; United States Department of Agriculture, Forest Service; and Iosco County Board of Commissioners

Iosco County is in the northeast quarter of the lower peninsula of Michigan (fig. 1). The county is bordered on the north by Alcona County, on the west by Ogemaw County, on the south by Arenac County, and on the east by Lake Huron. Iosco County covers an area of 361,837 acres, or about 565 square miles. About 64 percent of the county is forested, 11 percent is used for agriculture, and 25 percent is used for other purposes, including recreational facilities. The forested area includes 112,000 acres in the Huron National Forest. Tawas City, the county seat, has a population of 2,009. East Tawas has a population of 2,887.

Tourism is the main enterprise in the county. Timber production, agriculture, gypsum mining, and manufacturing also are important.

Soil scientists have determined that there are about 171 map units representing the various soils in Iosco County. The soils range widely in texture, natural drainage, slope, and other characteristics.

General Nature of the County

This section provides general information about Iosco County. It describes history and development, climate, lakes and streams, farming, industry and transportation facilities, and physiography.

History and Development

The original residents of Iosco County were Native Americans known as the Sauk Indians. These people were driven out of the area by a combination of the Chippewa, Ottawa, Menominee, and Algonquin tribes. The Ottawa and Algonquin tribes were still in the area when European settlers arrived.

The first European in the county was an Englishman named Henry who escaped the Mackinac massacre and was brought as a captive into the area in 1764 (Iosco County Historical Society). The first explorers were French fur traders. One of these was Louis Chevalier, who landed at the mouth of the Au Sable River some time before 1800 and was the first European resident in the survey area.

The State of Michigan created the county in 1857. The original county name was "Kahnotin," which means "in the path of the big wind" and refers to a devastating storm. Native Americans avoided this area until Henry Schoolcraft renamed the county "Iosco," which means "water of light." The name Ottawas Bay was also shortened to Tawas Bay.

Au Sable was the first settlement in the county. It was established when two families settled in 1848. Tawas City was platted in 1855. A second town was

Figure 1.—Location of Iosco County in Michigan.

established in 1887 at a mill site that workers from Tawas City referred to as "Going East," and thus it came to be called East Tawas.

In 1840, gypsum was discovered in outcroppings on the Lake Huron shoreline. Quarries were opened in 1862 in Alabaster Township. In 1891, the Western Plaster Works started business; in 1902, this company became the United States Gypsum Company. In 1926, National Gypsum was established.

Like most counties in northern Michigan, lumbering played a part in the development of Iosco County (fig. 2). Lumbering started in the mid 1860's and continued until about 1911, when large areas in northeastern Michigan burned, including Oscoda and Au Sable. The Lake Huron and Southwestern Railroad was built in 1877 to haul lumber and, later, farm products. In 1894, this railroad system became the Detroit and Mackinac Railroad.

In 1925, a runway was started for what was to become Camp Skeel, a harsh environment test facility. In 1942, this facility became the Oscoda Army Air Field. The base was closed for a few years after World War II but was reopened in 1948 as part of the Air Force's defense net. The base was renamed for Paul B. Wurtsmith in 1953. It was closed in 1992.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Hale Loud Dam in the period 1961 to 1990. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 20.6 degrees F and the average daily minimum temperature is 11.2 degrees. The lowest temperature on record, which occurred on February 17, 1979, is -40 degrees. In summer, the average temperature is 65.9 degrees and the average daily maximum temperature is 78.3 degrees. The highest recorded temperature, which occurred on August 24, 1948, is 100 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 28.07 inches. Of this, about 15.4 inches, or 55 percent, usually falls in April through September. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 3.24 inches on July 31, 1973. Thunderstorms occur on about 32 days each year, and most occur in June, July, and August.

The average seasonal snowfall is 50.2 inches. The greatest snow depth at any one time during the period of record was 46 inches. On the average, 112 days of the year have at least 1 inch of snow on the ground. The heaviest 1-day snowfall on record was 13.5 inches recorded on March 9, 1998.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 83 percent. The sun shines about 64 percent of the time possible in summer and 35 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 9 miles per hour, from November to April.

Lakes and Streams

The county has about 12,000 acres of scattered lakes (fig. 3), reservoirs, and ponds. These water areas range from less than 5 acres to more than 1,900 acres in size. Some lakes are in marshes and exhibit all stages of filling by vegetation. Most of the lakes are

Figure 2.—The Lumbermen's Monument, "erected to perpetuate the memory of the pioneer lumbermen of Michigan through whose labors was made possible the development of the prairie states."

Figure 3.—Increasing developmental pressure affects most of the lakes in Iosco County.

in the northern half of the county. Among the larger ones are Cooke Pond, 1,942 acres; Foote Pond, 1,824 acres; Tawas Lake, 1,670 acres; Van Ettan Lake, 1,320 acres; Long Lake, 493 acres; Loon Lake, 417 acres; and Sand Lake, 240 acres (Michigan United Conservation Clubs).

Iosco County has three major drainage systems—the Au Sable River, the Au Gres River, and the East

Branch of the Au Gres River. The Au Sable River drains the northern part of the county. It flows toward the east and enters the county in Plainfield Township. It empties into Lake Huron. The Au Gres River drains the southwestern part of the county. It enters the county in Reno Township and flows toward the southeast. It leaves the county in Sherman Township and empties into Saginaw Bay. The East Branch of the Au Gres River drains the west-central, central, and southern parts of the county. It leaves Loon Lake via Smith Creek, merges with Vaughan Creek in Grant Township, and flows toward the southeast. It leaves the county in Sherman Township and empties into Saginaw Bay.

Farming

Farming in Iosco County began in the late 1800's, around the same time as the lumbering era. Farmsteads were established throughout the county, but it was quickly apparent that the soils in the central part of the county were too sandy to support crops. The farming soon concentrated in areas of the loamy soils.

The better cropland is in the southwestern part of the county, along M-55 and along M-65 to about Hale. Dairy farming and a few areas of cash crops are the main farming enterprises in the county. According to recent statistics, the county has about 26,800 acres of cropland; this represents about 11 percent of the total acreage, including a large portion used for pasture (Fedewa, 1993). Much of the marginal land has been set aside as wildlife habitat.

Industry and Transportation Facilities

The major manufacturing operations in Iosco County are related to automobile products, aircraft repair, gypsum mining (fig. 4), and wood products.

There are two airports in the county. The local county airport is just northeast of East Tawas. The Oscoda-Wurtsmith airport in Oscoda, previously part of Wurtsmith Air Force Base, is used in the air industry. One railroad freight line serves the county. Three state highways run through the county.

Physiography

Most of the topographic features of the county are a result of erosion or deposition during the Wisconsin Glaciation, the most recent glacial period. The part of the glacier that covered Michigan began to recede about 14,000 years ago and moved completely out about 8,000 years ago. The glacial drift that was left as the ice melted covered the entire county to a depth ranging from 50 to several hundred feet. This drift formed such topographic features as moraines, till plains, outwash plains, lake plains, and glacial drainageways (Burgis and Eschman, 1981).

Figure 5 shows the glacial landforms in Iosco County. The western edge of the county is covered by the Hale Till Plain. This plain is nearly level to gently rolling and is dominantly loamy and clayey soils. A small moraine is along the county line around the Loon Lake area. This moraine has the most pronounced relief in the county. This area is also pocked with lakes, ponds, and small depressions. The dominant feature in the northern part of the county is the Jackpines Delta, which was formed as glacial meltwater deposited this sorted material via the glacial Au Sable drainageway. The delta has been eroded over thousands of years by the Au Sable River, which has cut down through this material a few hundred feet. This sandy, nearly level to rolling area is dominantly owned by the Huron National Forest. The meltwater was deposited in the glacial lakes that had many different levels across the county in the area known as the Oscoda Lake Plain. These glacial lakes had varying depths depending on the position of the glacier. The depth of water and the materials carried in the water influenced what was left behind when the glacial lakes dried up. Much of the meltwater from the Au Sable drainageway contained sand. This sand was deposited over some areas of clayey materials. The Oscoda Lake Plain is a nearly level to undulating area and contains fine textured soils; it also contains, in the southern part, soils that have a thin sandy cap over clays and silts. Closer to the edge of the delta, the soils are more sandy. Much of the Lake Huron shoreline has been shaped and reshaped by shore erosion caused by wave action. Sand is deposited into Lake Huron and is moved along the shoreline, forming beach ridges. As the water level of Lake Huron dropped, a series of beach ridges was left as a ridge-and-swale complex. This shoreline erosion and deposition have formed and are still forming points and spits along the Iosco County shore. Tawas Point and Au Sable Point are examples.

Figure 6 is a cross-section of the county showing elevation and landforms. The elevation of Iosco County ranges from about 580 feet above sea level along the Lake Huron shore to about 1,030 feet above sea level in the northwest corner of the county.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and

Figure 4.—Gypsum mining includes this area in the southwestern part of the county. The mines are strip mines that remove as much as 50 feet of earth to get to the gypsum rock.

miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; and the kinds of crops and native plants. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the

kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are

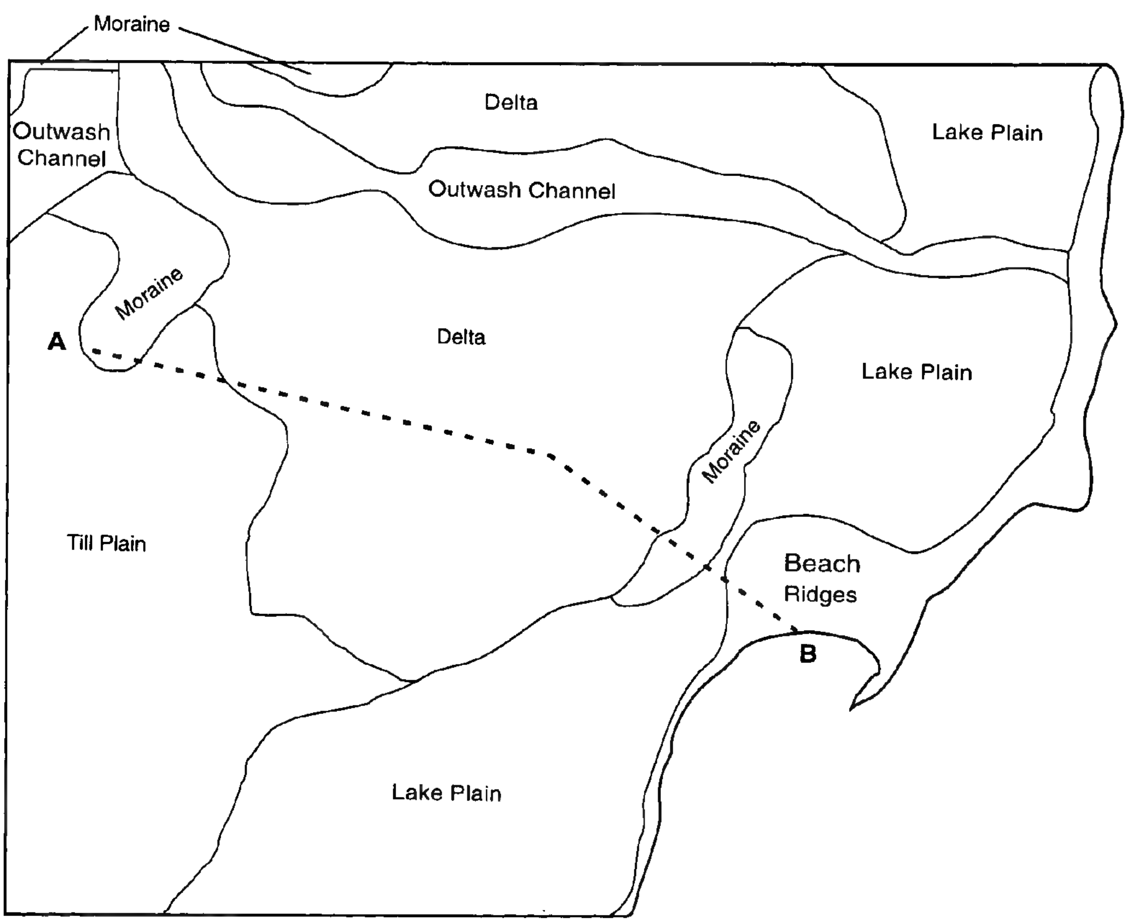

Figure 5.—The dominant glacial landforms in Iosco County (modified after Burgis and Eschman, 1981).

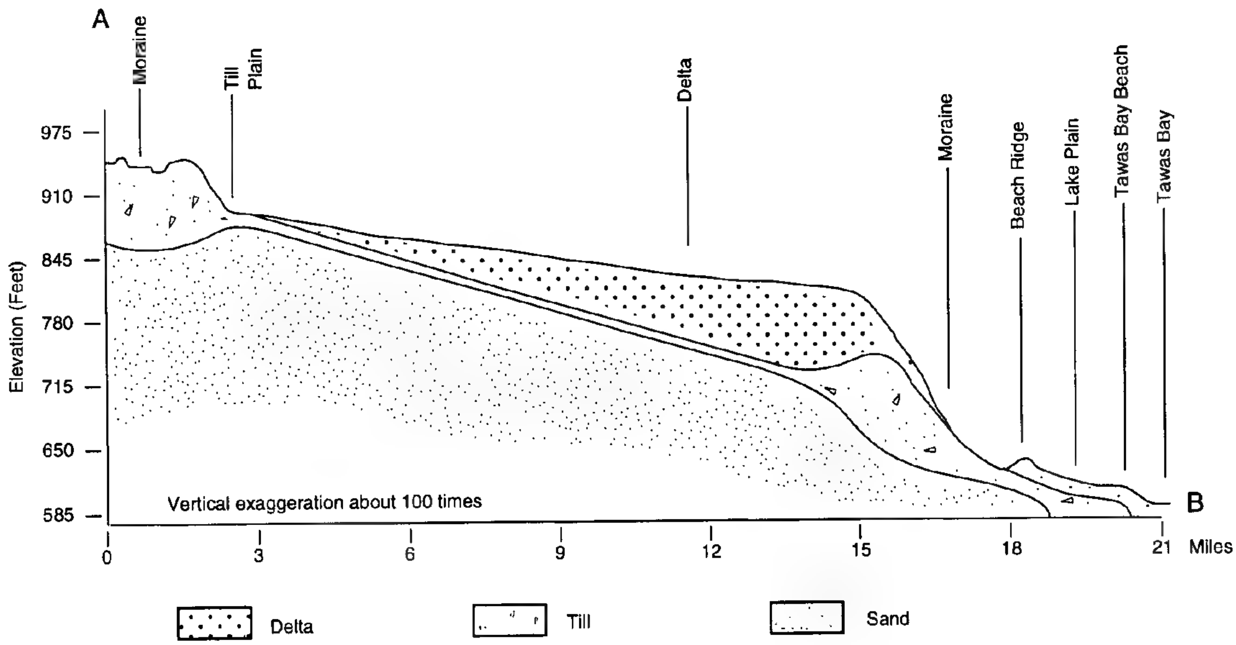

Figure 6.—A cross-section of Iosco County showing elevation and landforms (modified after Burgis and Eschman, 1981).

developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Some of the soil boundaries on the soil maps of Iosco County do not match those on the maps of adjacent counties, and some of the soil names and descriptions do not fully agree. Differences are the result of improvements in the classification of soils, particularly modifications or refinements in soil series concepts.

Survey Procedures

The general procedures followed in making this survey are described in the National Soil Survey Handbook of the Natural Resources Conservation Service. The Huron-Manistee National Forest ecological classification system (Cleland and others) was used in conjunction with the handbook to prepare the soil survey on most of the Forest Service lands and on some private tracts within the Huron National Forest administrative boundary. The map units on the Forest Service lands were designed differently from those in other parts of the survey area.

The ecological classification system is an integrated system that includes evaluation and classification of landscape areas using an ecological approach. Ecological units are mapped on aerial photographs, and interpretations are made from inventory maps for use in managing forest land and resources. In this survey, map symbols 209 to 282 identify map units within the Huron National Forest.

Procedures for Map Units 1 to 199 and 300 to 449

The soil survey maps made for conservation planning prior to the start of the project are among the references used. Before the actual fieldwork was begun, preliminary boundaries of slopes and landforms were plotted stereoscopically on 1:15,840 leaf-off aerial photography. U.S. Geological Survey

topographic maps, at a scale of 1:24,000, were used to relate land and image features.

A reconnaissance was made by pickup truck before the soil scientists traversed the surface on foot. In areas where the soil pattern is very complex, traverses and random observations were spaced as closely as 200 yards. In areas where the soil pattern is relatively simple, traverses were about one-fourth mile apart.

As they traversed the surface, the soil scientists divided the landscape into segments. For example, a hillside was separated from a swale and a gently sloping ridgetop from a very steep side slope.

Observations of such items as landforms, blown-down trees, vegetation, and roadbanks were made without regard to spacing. Soil boundaries were determined on the basis of soil examinations, observations, and photo interpretation. The soil material was examined with the aid of a hand auger or a spade to a depth of about 5 feet. The pedons described as typical were observed and studied in pits that were dug with shovels, mattocks, and digging bars.

Notes were taken on the composition of map units during the first year of the project. These notes were supplemented with additional notes as mapping progressed and as the composition of individual map units was determined.

Samples for chemical and physical analyses were taken from representative sites of some soils in the survey area. The analyses were made by the National Soil Survey Laboratory, Lincoln, Nebraska. The results of the studies can be obtained on request from the laboratory or from the State office of the Natural Resources Conservation Service in East Lansing, Michigan.

After the completion of soil mapping on aerial photographs, map unit delineations were transferred by hand to another set of the same photographs. Cultural features were recorded from observations of the maps and the landscape.

Several fairly large tracts of land in the survey area were not mapped. Landowners refused permission for soil scientists to map these areas. These areas are identified on the detailed soil maps by the symbol 380 (Access denied).

Procedures for Map Units 200 to 299

Before ecological units were mapped, information about the climate, geology, soils, hydrology, and vegetation in the survey area was collected. Research techniques were used in mid and late successional stands to collect information on vegetative and soil components in areas on uplands. Samples were not collected in early successional aspen stands, young stands, plantations, or stands disturbed by recent harvest or fires. The results were used to develop the ecological map units that are defined on the basis of both abiotic and biotic landscape characteristics.

A premapping reconnaissance was conducted in the survey area before actual field inventory began. An important result of the reconnaissance activities was a listing of the ecological units that were expected to be mapped in the area, the definition of features differentiating the units, and a set of specific sites in the Huron National Forest where detailed data had been collected and analyzed in the laboratory for quality control.

Following reconnaissance, the mapping personnel traversed the landscape, evaluated the components of the current ecosystems, determined and observed ecological unit boundaries in the field, and delineated preliminary map units on aerial photographs. During field mapping, stereo images, photo-tones, and photo colors were used to delineate landscape features on the aerial photographs. Some important characteristics used by the field personnel included water table levels, soil texture and color, drainage systems, geologic indicators, and interpretation of vegetative species groups.

Typically, mappers inventoried 300 to 500 acres per day. They performed detailed evaluations and completed note cards for 10 to 15 specific sites. These sites were strategically selected for the examination of landscape features and the collection of data on overstory, understory, ground flora, forest floor, soil, substratum, and ground water for documenting ecological units. Profiles of sandy soils were described to a depth of 15 feet. Because the presence of textural bands has been shown to have a significant influence on tree growth and species composition (Hannah and Zahner, 1970; Host and others, 1988), it was important to record the presence, absence, or intensity of deep-lying textural bands as part of the sampling and inventory scheme. These data are a permanent part of the forest records available at the Huron-Manistee National Forest supervisor's office.

Following field inventory, the final boundaries of the ecological units were drawn on the aerial photographs. The completed photography was checked for line closure and matching of delineations across photographs.

General Soil Map Units

The general soil map in this publication shows the soil associations in the survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The components of one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The general soil map units in this survey have been grouped for broad interpretive purposes. Each of the broad groups and the map units in each group are described on the following pages.

Soils on Wave-Built Terraces, Beach Ridges, and Dunes

These soils are generally used as woodland. The major management concerns are equipment limitations, seedling mortality, plant competition, and the windthrow hazard. Some areas, mostly along the Lake Huron shore, are used for building site development. The major soils are generally poorly suited or well suited to development. Wetness, ponding, slope, a poor filtering capacity, and a hazard of cutbanks caving are the major management concerns.

1. Au Gres-Tawas-Wurtsmith Association

Nearly level and undulating, somewhat poorly drained, very poorly drained, and moderately well drained, sandy and mucky soils on wave-built terraces and beach ridges

Setting

Landform: Beach ridges and wave-built terraces
Slope range: 0 to 6 percent

Composition

Percent of the survey area: Less than 1
Extent of the soils in the association:
Au Gres soils—40 percent
Tawas and similar soils—24 percent
Wurtsmith and similar soils—14 percent
Soils of minor extent—22 percent

Soil Properties and Qualities

Au Gres

Drainage class: Somewhat poorly drained
Position on the landform: Low ridges
Parent material: Sandy lake deposits
Texture of the surface layer: Sand
Slope class: Nearly level

Tawas

Drainage class: Very poorly drained
Position on the landform: Depressions and swales
Parent material: Herbaceous material over sandy lake deposits
Texture of the surface layer: Muck
Slope class: Nearly level

Wurtsmith

Drainage class: Moderately well drained
Position on the landform: Ridges and broad flat areas

Parent material: Sandy lake deposits
Texture of the surface layer: Sand
Slope class: Nearly level and undulating

Minor Soils

- The very poorly drained, sandy over clayey Wakeley soils in depressions
- The excessively drained East Lake soils in the higher positions

Use and Management

Major uses: Woodland, building site development
Major management concerns: Woodland—equipment limitations, seedling mortality, windthrow hazard, plant competition; building site development—wetness, hazard of cutbanks caving, poor filtering capacity, ponding, low strength

2. Deer Park-Meehan-Wurtsmith Association

Nearly level to rolling, excessively drained, somewhat poorly drained, and moderately well drained, sandy soils on wave-built terraces, beach ridges, and dunes

Setting

Landform: Wave-built terraces, beach ridges, and dunes (fig. 7)
Slope range: 0 to 18 percent

Composition

Percent of the survey area: 5
Extent of the soils in the association (fig. 8):
Deer Park and similar soils—25 percent
Meehan and similar soils—24 percent

Figure 7.—Shoreline erosion causes the development of sand spits at Au Sable Point. In the background are old beach ridges and swales of the Deer Park-Meehan-Wurtsmith association.

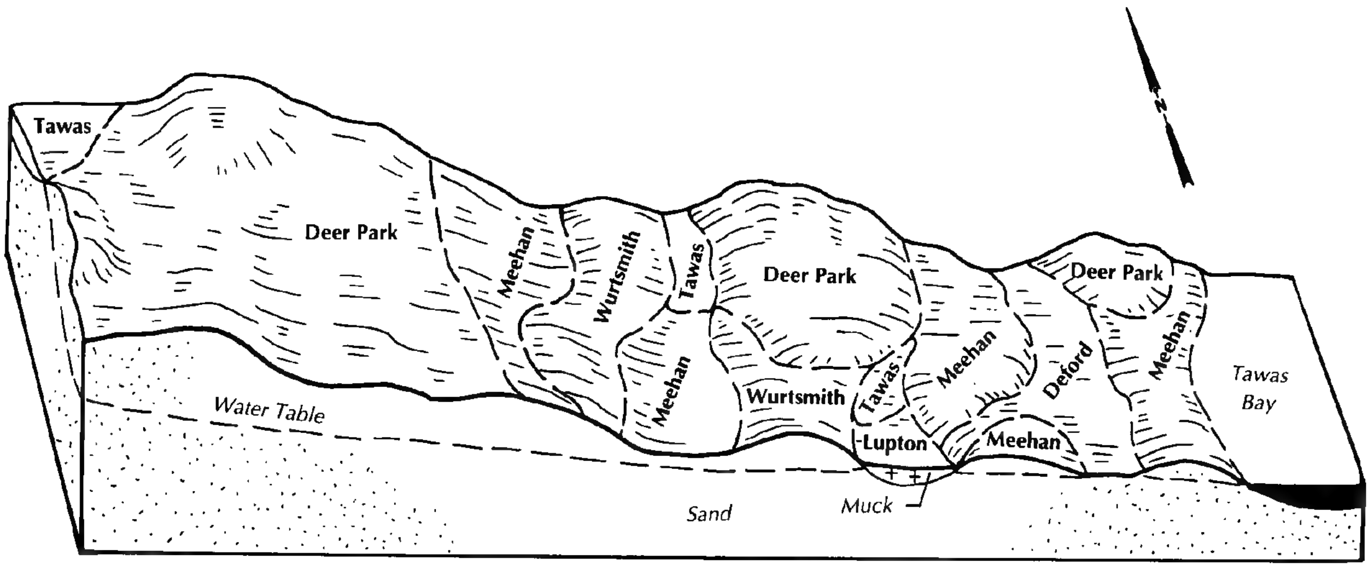

Figure 8.—Typical pattern of soils and landscape in the Deer Park-Meehan-Wurtsmith association.

Wurtsmith and similar soils—18 percent
Components of minor extent—33 percent

Soil Properties and Qualities

Deer Park

Drainage class: Excessively drained
Position on the landform: High ridges and dunes
Parent material: Sandy outwash, dune and beach deposits
Texture of the surface layer: Sand
Slope class: Nearly level to rolling

Meehan

Drainage class: Somewhat poorly drained
Position on the landform: Low ridges
Parent material: Sandy outwash and beach deposits
Texture of the surface layer: Sand
Slope class: Nearly level

Wurtsmith

Drainage class: Moderately well drained
Position on the landform: Ridges and broad flats
Parent material: Sandy outwash and beach deposits
Texture of the surface layer: Sand
Slope class: Nearly level and undulating

Minor Components

- The very poorly drained Tawas and Deford soils in depressions and swales and along drainageways
- Areas of Urban land near Oscoda and Tawas
- The somewhat poorly drained Winterfield soils along the Au Sable and Dead Au Sable Rivers

Use and Management

Major uses: Woodland, building site development
Major management concerns: Woodland—equipment limitations, seedling mortality, windthrow hazard, plant competition; building site development—hazard of cutbanks caving, poor filtering capacity, wetness, water erosion

3. Finch-Deford-Proper Association

Nearly level and undulating, somewhat poorly drained, very poorly drained, and moderately well drained, sandy and mucky soils on wave-built terraces

Setting

Landform: Wave-built terraces
Slope range: 0 to 6 percent

Composition

Percent of the survey area: 5
Extent of the soils in the association:
Finch and similar soils—35 percent
Deford soils—30 percent
Proper soils—10 percent
Soils of minor extent—25 percent

Soil Properties and Qualities

Finch

Drainage class: Somewhat poorly drained
Position on the landform: Broad flats
Parent material: Sandy lake sediments

Texture of the surface layer: Sand
Slope class: Nearly level

Deford

Drainage class: Very poorly drained
Position on the landform: Low flats and depressions
Parent material: Sandy lake sediments
Texture of the surface layer: Muck
Slope class: Nearly level

Proper

Drainage class: Moderately well drained
Position on the landform: Beach ridges and dunes
Parent material: Sandy lake deposits
Texture of the surface layer: Sand
Slope class: Nearly level and undulating

Minor Soils

- The very poorly drained Kanotin soils on broad flats and in depressions
- The very poorly drained Tawas and Lupton soils in depressions

Use and Management

Major uses: Woodland
Major management concerns: Equipment limitations, windthrow hazard, seedling mortality, plant competition

4. Deford-Tawas-Lupton Association

Nearly level, very poorly drained, sandy and mucky soils on wave-built terraces

Setting

Landform: Wave-built terraces
Slope range: 0 to 2 percent

Composition

Percent of the survey area: 6
Extent of the soils in the association:
Deford and similar soils—37 percent
Tawas and similar soils—21 percent
Lupton and similar soils—20 percent
Soils of minor extent—22 percent

Soil Properties and Qualities

Deford

Drainage class: Very poorly drained
Position on the landform: Low flats and depressions
Parent material: Sandy lake sediments
Texture of the surface layer: Muck
Slope class: Nearly level

Tawas

Drainage class: Very poorly drained
Position on the landform: Low flats and depressions
Parent material: Herbaceous muck over sandy lake sediments
Texture of the surface layer: Muck
Slope class: Nearly level

Lupton

Drainage class: Very poorly drained
Position on the landform: Low flats and depressions
Parent material: Herbaceous muck
Texture of the surface layer: Muck
Slope class: Nearly level

Minor Soils

- The somewhat poorly drained Winterfield soils in recent deposits along rivers
- The somewhat poorly drained Au Gres soils on low ridges
- The poorly drained Lacota soils on broad flats

Use and Management

Major uses: Woodland
Major management concerns: Equipment limitations, windthrow hazard, seedling mortality, plant competition

Soils on Outwash Plains, Stream Terraces, and Deltas

These soils are generally used as woodland. The major concerns in managing woodland are the windthrow hazard, plant competition, seedling mortality, the hazard of erosion, and equipment limitations. The major soils are generally unsuited to use as cropland and are unsuited or poorly suited to pasture. Droughtiness, wetness, and nutrient and pesticide loss are the major management concerns.

5. Borosaprists-Typic Udipsamments-Croswell Association

Nearly level to steep, very poorly drained, excessively drained, and moderately well drained, organic and sandy soils on stream terraces

Setting

Landform: Stream terraces
Slope range: 0 to 35 percent

Composition

Percent of the survey area: 5

Extent of the soils in the association:
Borosaprists—45 percent
Typic Udipsamments and similar soils—20 percent
Croswell soils—10 percent
Soils of minor extent—25 percent

Soil Properties and Qualities

Borosaprists

Drainage class: Very poorly drained
Position on the landform: Backswamps and along drainageways
Parent material: Herbaceous muck
Texture of the surface layer: Muck
Slope class: Nearly level

Typic Udipsamments

Drainage class: Excessively drained
Position on the landform: Side slopes
Parent material: Sandy outwash
Texture of the surface layer: Sand
Slope class: Rolling to steep

Croswell

Drainage class: Moderately well drained
Position on the landform: Ridges and knolls
Parent material: Sandy outwash
Texture of the surface layer: Sand
Slope class: Nearly level and undulating

Minor Soils

- The somewhat poorly drained Au Gres soils on low ridges and knolls
- The very poorly drained Deford soils in depressions and along drainageways
- The well drained Coppler soils and Argic Endoaquods on terraces along the Au Sable River

Use and Management

Major uses: Woodland
Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition, water erosion

6. Grayling Association

Nearly level to rolling, excessively drained, sandy soils on outwash plains and deltas

Setting

Landform: Outwash plains and deltas
Slope range: 0 to 18 percent

Composition

Percent of the survey area: 37
Extent of the soils in the association:
Grayling and similar soils—76 percent
Soils of minor extent—24 percent

Soil Properties and Qualities

Grayling

Drainage class: Excessively drained
Position on the landform: Broad plains
Parent material: Sandy outwash
Texture of the surface layer: Sand
Slope class: Nearly level to rolling

Minor Soils

- The moderately well drained Croswell soils in the lower positions
- The very poorly drained Tawas and Lupton soils in depressions and along drainageways

Use and Management

Major uses: Woodland
Major management concerns: Equipment limitations, seedling mortality

7. Au Gres-Croswell-Rubicon Association

Nearly level to rolling, somewhat poorly drained, moderately well drained, and excessively drained, sandy soils on outwash plains and deltas

Setting

Landform: Outwash plains and deltas
Slope range: 0 to 18 percent

Composition

Percent of the survey area: 11
Extent of the soils in the association:
Au Gres soils—30 percent
Croswell soils—27 percent
Rubicon soils—11 percent
Soils of minor extent—32 percent

Soil Properties and Qualities

Au Gres

Drainage class: Somewhat poorly drained
Position on the landform: Low flats
Parent material: Sandy outwash
Texture of the surface layer: Sand
Slope class: Nearly level

Croswell

Drainage class: Moderately well drained
Position on the landform: Broad flats

Parent material: Sandy outwash
Texture of the surface layer: Sand
Slope class: Nearly level and undulating

Rubicon

Drainage class: Excessively drained
Position on the landform: Knolls and ridges
Parent material: Sandy outwash
Texture of the surface layer: Sand
Slope class: Nearly level to rolling

Minor Soils

• The somewhat poorly drained, sandy over clayey Allendale soils on low knolls and low ridges
• The very poorly drained Deford and Tawas soils in depressions and along drainageways

Use and Management

Major uses: Woodland
Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition

Soils on Lake Plains

These soils are used as cropland, pasture, or woodland or as gypsum mines. They are well suited or moderately well suited to use as cropland or pasture. The major management concerns affecting cropland are water erosion, compaction, slow permeability, nutrient and pesticide loss, soil blowing, wetness, and tilth of the surface layer. Wetness, compaction, overgrazing, and droughtiness are the main concerns affecting pasture management. Equipment limitations, the hazard of erosion, seedling mortality, the windthrow hazard, and plant competition are the main management concerns in the areas of woodland.

Onsite investigation is needed to determine the suitability of these soils for specific uses in or around gypsum mines.

8. Manary-Whittemore-Iargo Association

Nearly level to gently rolling, somewhat poorly drained and moderately well drained, sandy and loamy soils

Setting

Landform: Lake plains
Slope range: 0 to 12 percent

Composition

Percent of the survey area: 5
Extent of the soils in the association (fig. 9):
Manary and similar soils—27 percent
Whittemore and similar soils—21 percent
Iargo and similar soils—20 percent
Soils of minor extent—32 percent

Soil Properties and Qualities

Manary

Drainage class: Somewhat poorly drained
Position on the landform: Broad plains and low knolls
Parent material: Fine textured lacustrine deposits
Texture of the surface layer: Silty clay loam
Slope class: Nearly level

Whittemore

Drainage class: Somewhat poorly drained
Position on the landform: Low ridges
Parent material: Sandy over clayey lacustrine deposits
Texture of the surface layer: Sand
Slope class: Nearly level

Iargo

Drainage class: Moderately well drained
Position on the landform: Knolls and ridges
Parent material: Fine textured lacustrine deposits
Texture of the surface layer: Silt loam
Slope class: Nearly level to gently rolling

Minor Soils

• The poorly drained Springport soils in depressions and along drainageways
• The moderately well drained Skeel soils on ridges
• The well drained Mongo soils on steep side slopes

Use and Management

Major uses: Cropland and pasture
Major management concerns: Cropland—wetness, slow permeability, compaction, tilth, soil blowing, nutrient and pesticide loss, water erosion; pasture—wetness, compaction

9. Algonquin-Allendale-Springport Association

Nearly level, somewhat poorly drained and poorly drained, clayey, sandy, and loamy soils

Setting

Landform: Lake plains
Slope range: 0 to 3 percent

Composition

Percent of the survey area: 2
Extent of the soils in the association:
Algonquin and similar soils—33 percent
Allendale and similar soils—31 percent

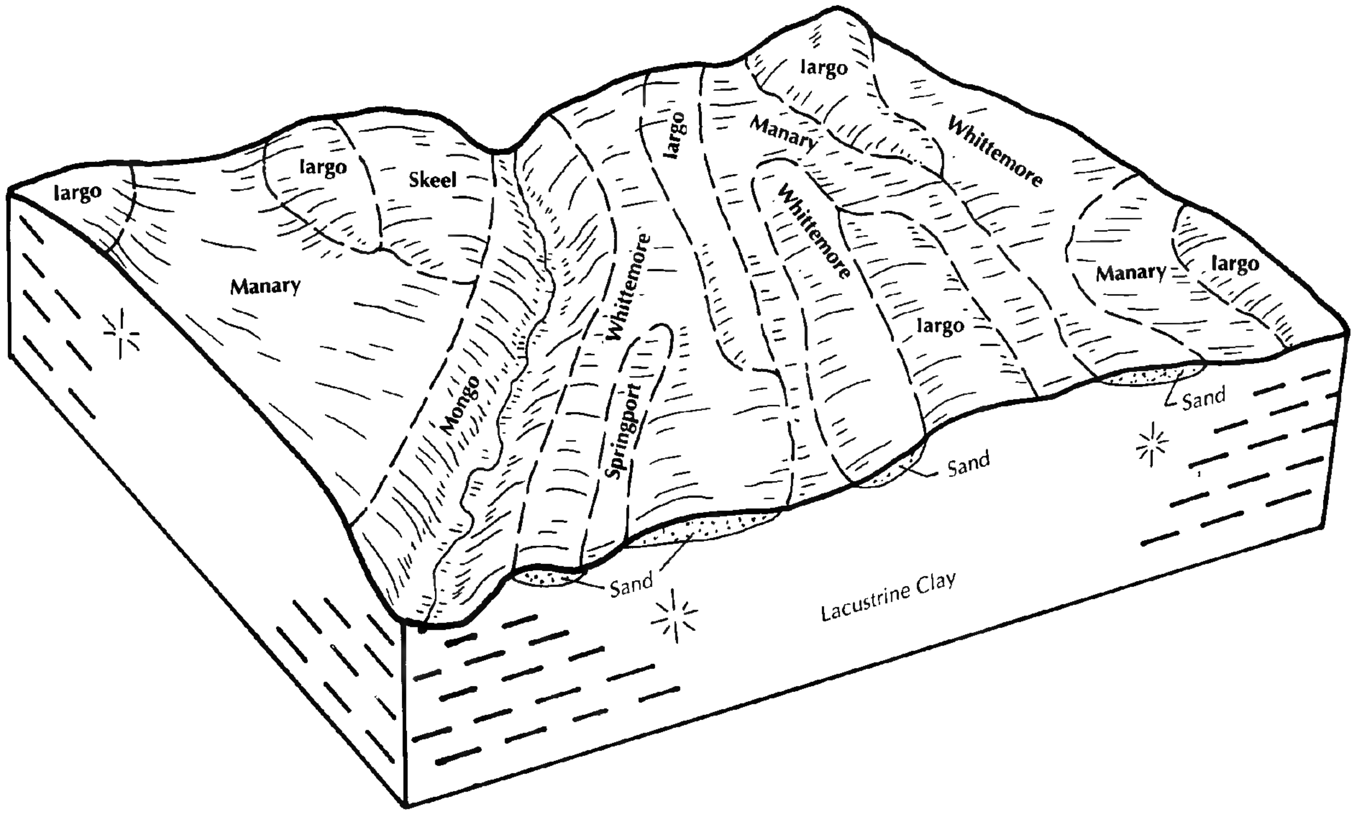

Figure 9.—Typical pattern of soils and landscape in the Manary-Whittemore-Iargo association.

Springport and similar soils—16 percent
Soils of minor extent—20 percent

Soil Properties and Qualities

Algonquin

Drainage class: Somewhat poorly drained
Position on the landform: Low ridges and broad plains
Parent material: Fine textured lacustrine deposits
Texture of the surface layer: Clay
Slope class: Nearly level

Allendale

Drainage class: Somewhat poorly drained
Position on the landform: Low ridges
Parent material: Sandy over clayey lacustrine deposits
Texture of the surface layer: Sand
Slope class: Nearly level

Springport

Drainage class: Poorly drained
Position on the landform: Depressions and along drainageways
Parent material: Fine textured lacustrine deposits
Texture of the surface layer: Silt loam
Slope class: Nearly level

Minor Soils

• The very poorly drained, sandy over clayey Wakeley soils in depressions and along drainageways
• The moderately well drained Negwegon soils on side slopes

Use and Management

Major uses: Cropland and pasture
Major management concerns: Cropland—wetness, slow permeability, tilth, compaction, soil blowing, low content of organic matter, nutrient and pesticide loss, ponding; pasture—wetness, compaction, overgrazing

10. McIvor-Wakeley Association

Nearly level, somewhat poorly drained and very poorly drained, sandy and mucky soils

Setting

Landform: Lake plains
Slope range: 0 to 3 percent

Composition

Percent of the survey area: 4
Extent of the soils in the association:
McIvor and similar soils—45 percent
Wakeley and similar soils—25 percent
Soils of minor extent—30 percent

Soil Properties and Qualities

McIvor

Drainage class: Somewhat poorly drained
Position on the landform: Low knolls and broad flats
Parent material: Sandy over clayey lacustrine deposits
Texture of the surface layer: Sand
Slope class: Nearly level

Wakeley

Drainage class: Very poorly drained
Position on the landform: Depressions and along drainageways
Parent material: Sandy over clayey lacustrine deposits
Texture of the surface layer: Muck
Slope class: Nearly level

Minor Soils

- The very poorly drained Kanotin and Tawas soils in depressions
- The moderately well drained Proper soils on low ridges

Use and Management

Major uses: Woodland and pasture
Major management concerns: Woodland—equipment limitations, windthrow hazard, seedling mortality, plant competition; pasture—wetness, overgrazing, droughtiness

11. Udorthents Association

Nearly level to very steep, loamy mine spoil and gypsum mines

Setting

Landform: Lake plains
Slope range: 0 to 50 percent

Composition

Percent of the survey area: 1
Extent of the soils in the association:
Udorthents and similar soils—80 percent
Soils of minor extent—20 percent

Soil Properties and Qualities

Udorthents

Drainage class: Well drained
Position on the landform: Manmade ridges and pits
Parent material: Fine textured lacustrine deposits
Texture of the surface layer: Silty clay loam
Slope class: Nearly level to very steep

Minor Soils

- The somewhat poorly drained, loamy Algonquin and Manary soils in nearly level undisturbed areas
- The somewhat poorly drained, sandy over loamy Allendale soils in nearly level undisturbed areas

Use and Management

Major uses: Gypsum mines and mine spoil
Major management concerns: Onsite investigation is needed to determine the suitability for specific uses.

Soils on Till Plains and Moraines

These soils are used as cropland, pasture, or woodland. They are the primary agricultural soils in the county. They are well suited or moderately well suited to use as cropland or pasture. The major management concerns affecting crops and pasture are water erosion, soil blowing, compaction, slow permeability, nutrient and pesticide loss, droughtiness, wetness, and tilth. Equipment limitations, seedling mortality, the windthrow hazard, and plant competition are the main management concerns in the areas of woodland. Wetness, the shrink-swell potential, a hazard of cutbanks caving, and frost action are the main management concerns affecting building site development.

12. Selkirk-Kent Association

Nearly level to gently rolling, somewhat poorly drained and moderately well drained, loamy soils on till plains

Setting

Landform: Till plains
Slope range: 0 to 12 percent

Composition

Percent of the survey area: 1
Extent of the soils in the association:
Selkirk and similar soils—52 percent
Kent and similar soils—30 percent
Soils of minor extent—18 percent

Soil Properties and Qualities

Selkirk

Drainage class: Somewhat poorly drained
Position on the landform: Flat areas and low knolls
Parent material: Fine textured till
Texture of the surface layer: Loam
Slope class: Nearly level and undulating

Kent

Drainage class: Moderately well drained
Position on the landform: Knolls and ridges
Parent material: Fine textured till
Texture of the surface layer: Sandy loam
Slope class: Undulating and gently rolling

Minor Soils

- The moderately well drained, sandy over loamy Morganlake soils on knolls and ridges
- The somewhat poorly drained, sandy over loamy Allendale soils in flat areas and on low knolls
- The poorly drained Sims soils in depressions and along drainageways

Use and Management

Major uses: Cropland and pasture
Major management concerns: Cropland—tilth, slow permeability, nutrient and pesticide loss, water erosion, wetness, compaction; pasture—wetness, compaction

13. Kawkawlin-Nester Association

Nearly level to gently rolling, somewhat poorly drained and moderately well drained, loamy soils on till plains

Setting

Landform: Till plains
Slope range: 0 to 12 percent

Composition

Percent of the survey area: 8
Extent of the soils in the association:
Kawkawlin and similar soils—40 percent
Nester and similar soils—28 percent
Soils of minor extent—32 percent

Soil Properties and Qualities

Kawkawlin

Drainage class: Somewhat poorly drained
Position on the landform: Low knolls and broad plains
Parent material: Fine textured till
Texture of the surface layer: Loam
Slope class: Nearly level and undulating

Nester

Drainage class: Moderately well drained
Position on the landform: Knolls and ridges
Parent material: Fine textured till
Texture of the surface layer: Sandy loam
Slope class: Undulating and gently rolling

Minor Soils

- The moderately well drained, sandy over loamy Morganlake soils on knolls and ridges
- The poorly drained Sims soils in depressions and along drainageways
- The somewhat poorly drained, sandy over loamy Kokosing soils on low knolls

Use and Management

Major uses: Cropland and pasture
Major management concerns: Cropland—water erosion, tilth, slow permeability, nutrient and pesticide loss, compaction, wetness, soil blowing; pasture—compaction, wetness, overgrazing

14. Morganlake-Nester Association

Nearly level to gently rolling, moderately well drained, sandy and loamy soils on till plains and moraines

Setting

Landform: Till plains and moraines
Slope range: 0 to 12 percent

Composition

Percent of the survey area: 4
Extent of the soils in the association:
Morganlake and similar soils—53 percent
Nester and similar soils—30 percent
Soils of minor extent—17 percent

Soil Properties and Qualities

Morganlake

Drainage class: Moderately well drained
Position on the landform: Knolls and ridges
Parent material: Sandy over loamy till
Texture of the surface layer: Sand
Slope class: Nearly level to gently rolling

Nester

Drainage class: Moderately well drained
Position on the landform: Knolls and ridges

Parent material: Fine textured till
Texture of the surface layer: Sandy loam
Slope class: Undulating and gently rolling

Minor Soils

• The somewhat poorly drained Kokosing soils on low knolls and low ridges
• The excessively drained, sandy Rubicon soils on the higher knolls and ridges
• The very poorly drained Tawas and Lupton soils in depressions and along drainageways

Use and Management

Major uses: Woodland, building site development
Major management concerns: Woodland—equipment limitations, plant competition, seedling mortality; building site development—shrink-swell potential, frost action, hazard of cutbanks caving, wetness

15. Glennie-Sprinkler Association

Nearly level to gently rolling, moderately well drained and somewhat poorly drained, loamy soils on ground moraines

Setting

Landform: Moraines
Slope range: 0 to 12 percent

Composition

Percent of the survey area: Less than 1
Extent of the soils in the association:
Glennie and similar soils—75 percent
Sprinkler soils—15 percent
Soils of minor extent—10 percent

Soil Properties and Qualities

Glennie

Drainage class: Moderately well drained
Position on the landform: Knolls and ridges
Parent material: Loamy till
Texture of the surface layer: Loamy sand
Slope class: Nearly level to gently rolling

Sprinkler

Drainage class: Somewhat poorly drained
Position on the landform: Broad plains
Parent material: Loamy till
Texture of the surface layer: Sandy loam
Slope class: Nearly level

Minor Soils

• The very poorly drained Wakeley soils along drainageways

Use and Management

Major uses: Cropland and woodland
Major management concerns: Cropland—wetness, soil blowing, nutrient and pesticide loss, droughtiness; woodland—equipment limitations, windthrow hazard, plant competition, seedling mortality

16. Kawkawlin-Allendale-Nester Association

Nearly level to gently rolling, somewhat poorly drained and moderately well drained, loamy and sandy soils on till plains and moraines

Setting

Landform: Till plains and moraines
Slope range: 0 to 12 percent

Composition

Percent of the survey area: 2
Extent of the soils in the association:
Kawkawlin and similar soils—35 percent
Allendale and similar soils—22 percent
Nester and similar soils—15 percent
Soils of minor extent—28 percent

Soil Properties and Qualities

Kawkawlin

Drainage class: Somewhat poorly drained
Position on the landform: Low knolls and broad plains
Parent material: Fine textured till
Texture of the surface layer: Sandy loam
Slope class: Nearly level and undulating

Allendale

Drainage class: Somewhat poorly drained
Position on the landform: Low knolls
Parent material: Sandy over clayey till
Texture of the surface layer: Sand
Slope class: Nearly level

Nester

Drainage class: Moderately well drained
Position on the landform: Knolls and ridges
Parent material: Fine textured till
Texture of the surface layer: Sandy loam

Slope class: Undulating and gently rolling

Minor Soils

- The very poorly drained, ponded Aquepts and the very poorly drained Wakeley soils along drainageways and in depressions
- The somewhat poorly drained Au Gres soils on low knolls
- The moderately well drained, sandy over loamy Morganlake soils on knolls

Use and Management

Major uses: Woodland and cropland
Major management concerns: Woodland—equipment limitations, plant competition, windthrow hazard, seedling mortality; cropland—slow permeability, nutrient and pesticide loss, tilth, water erosion, soil blowing, low content of organic matter

17. Kawkawlin-Sims Association

Nearly level and undulating, somewhat poorly drained and poorly drained, loamy soils on till plains

Setting

Landform: Till plains
Slope range: 0 to 4 percent

Composition

Percent of the survey area: 3
Extent of the soils in the association:
Kawkawlin and similar soils—50 percent
Sims and similar soils—24 percent
Soils of minor extent—26 percent

Soil Properties and Qualities

Kawkawlin

Drainage class: Somewhat poorly drained
Position on the landform: Low knolls and broad plains
Parent material: Fine textured till
Texture of the surface layer: Sandy loam
Slope class: Nearly level and undulating

Sims

Drainage class: Poorly drained
Position on the landform: Depressions and along drainageways
Parent material: Fine textured till
Texture of the surface layer: Loam
Slope class: Nearly level

Minor Soils

- The moderately well drained Nester soils on knolls and ridges
- The somewhat poorly drained Kokosing soils on low ridges and low knolls
- The very poorly drained Tawas and Lupton soils in depressions

Use and Management

Major uses: Woodland and cropland
Major management concerns: Woodland—equipment limitations, plant competition, windthrow hazard, seedling mortality; cropland—wetness, slow permeability, tilth, compaction, ponding, nutrient and pesticide loss, water erosion

Detailed Soil Map Units

The map units delineated on the detailed soil maps in this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information about each map unit is given under the heading "Use and Management of the Soils."

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit descriptions. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series.* Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases.* Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Nester sandy loam, 1 to 6 percent slopes, is a phase of the Nester series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are called complexes or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Whittemore-Springport complex, 0 to 3 percent slopes, is an example.

An *undifferentiated group* is made up of two or

more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Histosols and Aquents, ponded, is an undifferentiated group in this survey area.

This survey includes *miscellaneous areas.* Such areas have little or no soil material and support little or no vegetation. The map unit Pits, borrow, is an example.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see Contents) give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

12B—Tawas-Au Gres complex, 0 to 4 percent slopes

Setting

Landform: Beach ridges
Slope range: Tawas—0 to 2 percent; Au Gres—0 to 4 percent
Shape of areas: Linear
Size of areas: 10 to 100 acres

Typical Profile

Tawas

Surface layer:
0 to 12 inches—black muck

Subsoil:
12 to 24 inches—black, very friable muck

Substratum:
24 to 80 inches—light brownish gray sand

Au Gres

Surface layer:
0 to 3 inches—black, partially decomposed leaf litter

Subsurface layer:
3 to 9 inches—pinkish gray, mottled sand

Subsoil:
9 to 14 inches—dark reddish brown and dark brown, mottled, very friable sand
14 to 29 inches—yellowish brown, mottled, loose sand

Substratum:
29 to 80 inches—very pale brown sand

Soil Properties and Qualities

Permeability: Tawas—moderately slow to moderately rapid in the mucky part and rapid in the sandy part; Au Gres—rapid
Available water capacity: Tawas—high; Au Gres—low
Drainage class: Tawas—very poorly drained; Au Gres—somewhat poorly drained
Seasonal high water table: Tawas—apparent, 1 foot above to 1 foot below the surface at some time from October through May; Au Gres—apparent, at a depth of 0.5 foot to 1.5 feet at some time from October through May
Surface runoff: Tawas—ponded; Au Gres—very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Tawas—moderate; Au Gres—severe
Shrink-swell potential: Low
Potential for frost action: Tawas—high; Au Gres—moderate

Composition

Tawas soil and similar soils: 60 to 70 percent
Au Gres soil and similar soils: 25 to 40 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The very poorly drained Deford soils, which have organic material less than 8 inches thick
- The moderately well drained Wurtsmith soils

Similar inclusions:
- Soils that have organic layers more than 51 inches thick
- Soils that do not have a dark reddish brown subsoil

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, windthrow hazard, plant competition, seedling mortality, seasonal wetness
Management considerations:
- Equipment should be used only when the soil is relatively dry or has an adequate snow cover.
- Carefully managed reforestation helps to control undesirable understory plants.

• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Trees that can withstand seasonal wetness should be selected for planting in areas of the Au Gres soil.
• If trees are planted, site preparation is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on the Tawas soil.

Building sites

Major management concerns: Tawas—ponding; Au Gres—seasonal wetness, cutbanks caving
Management considerations:
• In areas of the Au Gres soil, buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• In areas of the Au Gres soil, wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.
• Because cutbanks in areas of the Au Gres soil are not stable and are subject to caving, trench walls should be reinforced.
• Because of ponding, the Tawas soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Tawas—ponding; Au Gres—rapid permeability, seasonal wetness
Management considerations:
• The poor filtering capacity of the Au Gres soil can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
• Filling or mounding with suitable material helps to raise the absorption field above the water table in areas of the Au Gres soil.
• Because of ponding, the Tawas soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: Tawas—5W; Au Gres—6W
Michigan soil management group: Tawas—M/4c; Au Gres—5b

13—Tawas-Lupton mucks

Setting

Landform: Outwash plains, lake plains, till plains, and moraines
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 500 acres

Typical Profile

Tawas

Surface layer:
0 to 12 inches—black muck

Subsoil:
12 to 24 inches—black, friable muck

Substratum:
24 to 80 inches—light brownish gray sand

Lupton

Surface layer:
0 to 30 inches—black muck

Substratum:
30 to 80 inches—black and dark reddish brown muck

Soil Properties and Qualities

Permeability: Tawas—moderately slow to moderately rapid in the mucky part and rapid in the sandy part; Lupton—moderately slow to moderately rapid
Available water capacity: Tawas—high; Lupton—very high
Drainage class: Very poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from October through May
Surface runoff: Very slow or ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Tawas—low; Lupton—none
Potential for frost action: High

Composition

Tawas soil and similar soils: 35 to 70 percent
Lupton soil and similar soils: 25 to 50 percent
Contrasting inclusions: 0 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres soils

- The very poorly drained Deford soils
- Small areas of open water

Similar inclusions:
- Soils that have thin layers of loamy material in the substratum
- Soils that have muck layers less than 16 inches thick
- Soils that are extremely acid

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition, seasonal wetness
Management considerations:
- Because of wetness and low strength, special harvesting equipment is needed. The equipment can be used only during periods in winter when skid roads and access roads are frozen.
- Log landings should be located on drier, more suitable soils.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
- Because of wetness, seedling mortality, and plant competition, trees are generally not planted on these soils.
- Carefully managed reforestation helps to control undesirable understory plants.
- Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings are beneficial for natural regeneration.

Building sites

Major management concerns: Ponding
Management considerations:
- Because of ponding, these soils are generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Ponding
Management considerations:
- Because of ponding, these soils are generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: Tawas—5W; Lupton—2W
Michigan soil management group: Tawas—M/4c; Lupton—Mc

15A—Croswell-Au Gres sands, 0 to 3 percent slopes

Setting

Landform: Outwash plains and lake plains
Slope range: 0 to 3 percent
Shape of areas: Irregular or linear
Size of areas: 10 to 50 acres

Typical Profile

Croswell

Surface layer:
0 to 4 inches—very dark gray sand

Subsurface layer:
4 to 7 inches—light gray sand

Subsoil:
7 to 11 inches—dark brown, very friable sand
11 to 36 inches—yellowish brown and brownish yellow, loose sand

Substratum:
36 to 60 inches—brownish yellow, mottled sand
60 to 80 inches—pale brown sand

Au Gres

Surface layer:
0 to 3 inches—black, partially decomposed leaf litter

Subsurface layer:
3 to 9 inches—pinkish gray, mottled sand

Subsoil:
9 to 14 inches—dark reddish brown and dark brown, mottled, very friable sand
14 to 29 inches—yellowish brown, mottled, loose sand

Substratum:
29 to 80 inches—very pale brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Croswell—moderately well drained; Au Gres—somewhat poorly drained
Seasonal high water table: Croswell—apparent, at a depth of 2.0 to 3.5 feet at some time from November through May; Au Gres—apparent, at a depth of 0.5 foot to 1.5 feet at some time from October through May
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe

Shrink-swell potential: Low
Potential for frost action: Croswell—low; Au Gres—moderate

Composition

Croswell soil and similar soils: 35 to 70 percent
Au Gres soil and similar soils: 25 to 60 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
- The very poorly drained Deford soils
- The excessively drained Grayling soils

Similar inclusions:
- Soils that have a surface layer of loamy sand
- Soils that do not have a dark reddish brown or dark brown subsoil

Use and Management

Land use: Woodland

Woodland

Major management concerns: Croswell—equipment limitations, seedling mortality, windthrow hazard, plant competition, seasonal droughtiness; Au Gres—equipment limitations, seedling mortality, windthrow hazard, plant competition, seasonal wetness
Management considerations:
- Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- Planting when the soil is moist can reduce the seedling mortality rate on the Croswell soil.
- Trees that can withstand seasonal wetness should be selected for planting on the Au Gres soil.
- Planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
- Carefully managed reforestation helps to control undesirable understory plants.
- Special harvest methods may be needed to control undesirable plants.

Building sites

Major management concerns: Cutbanks caving, seasonal wetness
Management considerations:
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
- Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.
- Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.

Septic tank absorption fields

Major management concerns: Rapid permeability, seasonal wetness
Management considerations:
- The poor filtering capacity of these soils can result in the pollution of ground water.
- Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
- Filling or mounding with suitable material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: Croswell—5S; Au Gres—6W
Michigan soil management group: Croswell—5a; Au Gres—5b

16B—Graycalm sand, 0 to 6 percent slopes

Setting

Landform: Outwash plains and stream terraces
Shape of areas: Irregular
Size of areas: 10 to 1,000 acres

Typical Profile

Surface layer:
0 to 4 inches—black sand

Subsoil:
4 to 16 inches—strong brown, friable sand
16 to 45 inches—yellowish brown, brownish yellow, and yellow, very friable sand

Substratum:
45 to 80 inches—very pale brown sand with bands of strong brown loamy sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Very slow

Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Graycalm soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The excessively drained Rubicon soils, which have reddish brown development in the subsoil

Similar inclusions:
• Soils that do not have bands of loamy sand in the substratum

Use and Management

Dominant land use: Woodland
Other uses: Pasture

Pasture

Major management concerns: Seasonal droughtiness, overgrazing
Management considerations:
• Proper stocking rates, uniform distribution of grazing, and a planned grazing system help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests can help to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.

Building sites

Major management concerns: Cutbanks caving
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.

Septic tank absorption fields

Major management concerns: Rapid permeability
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 6S
Michigan soil management group: 5a

16D—Graycalm sand, 12 to 18 percent slopes

Setting

Landform: Outwash plains and stream terraces
Shape of areas: Irregular
Size of areas: 10 to 60 acres

Typical Profile

Surface layer:
0 to 1 inch—black sand

Subsoil:
1 to 4 inches—strong brown, very friable sand
4 to 46 inches—strong brown, very friable loamy sand

Substratum:
46 to 80 inches—light yellowish brown sand with bands of brown loamy sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Graycalm soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Glennie soils

Similar inclusions:
• Soils that do not have bands of loamy sand in the substratum

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
• Because loose sand and the slope can hinder the traction of wheeled equipment, skid roads should be built on the contour or on the gentler slopes.
• Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.

Building sites

Major management concerns: Cutbanks caving, slope
Management considerations:
• Because cutbanks are unstable and are subject to caving, trench walls should be reinforced.
• This soil is poorly suited to building site development unless extensive land shaping is feasible.

Septic tank absorption fields

Major management concerns: Slope, rapid permeability
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 6R
Michigan soil management group: 5a

17B—Croswell sand, 0 to 6 percent slopes

Setting

Landform: Outwash plains, till plains, and lake plains
Shape of areas: Linear or irregular
Size of areas: 5 to 300 acres

Typical Profile

Surface layer:
0 to 4 inches—very dark gray sand

Subsurface layer:
4 to 7 inches—light gray sand

Subsoil:
7 to 11 inches—dark brown, very friable sand
11 to 36 inches—yellowish brown and brownish yellow, loose sand

Substratum:
36 to 60 inches—brownish yellow, mottled sand
60 to 80 inches—pale brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: Apparent, at a depth of 2.0 to 3.5 feet at some time from November through May
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Croswell soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained, sandy over loamy Morganlake soils
• The very poorly drained Leafriver soils

Similar inclusions:
• Soils that have a surface layer of loamy sand
• Soils that do not have a dark brown subsoil layer
• Soils that are somewhat poorly drained

Use and Management

Dominant land use: Woodland
Other uses: Cropland, pasture

Cropland

Major management concerns: Low content of organic matter, soil blowing, seasonal droughtiness, nutrient and pesticide loss
Management considerations:
• Conservation tillage, windbreaks, crop residue

management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing. Maintaining a permanent plant cover also helps to control soil blowing.
• A system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture and in reducing the hazard of soil blowing.
• Increasing the content of organic matter in the root zone may increase the ability of the soil to hold water, nutrients, and pesticides and can minimize the pollution of ground water.
• The nutrients in manure and fertilizer applications should not exceed the requirements of the plants.
• The rate of water infiltration can be increased by growing cover crops, leaving crop residue on the surface, and regularly adding other organic material.
• Including green manure crops in the cropping sequence, applying a system of conservation tillage, and properly managing crop residue increase the content of organic matter.

Pasture

Major management concerns: Seasonal droughtiness, overgrazing
Management considerations:
• Proper stocking rates, uniform distribution of grazing, and a planned grazing system help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests can help to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition, seasonal droughtiness
Management considerations:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.

Building sites

Major management concerns: Cutbanks caving, seasonal wetness
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.

Septic tank absorption fields

Major management concerns: Rapid permeability, seasonal wetness
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 5S
Michigan soil management group: 5a

18A—Au Gres sand, 0 to 3 percent slopes

Setting

Landform: Lake plains, till plains, and outwash plains
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Typical Profile

Surface layer:
0 to 3 inches—black, partially decomposed leaf litter

Subsurface layer:
3 to 9 inches—pinkish gray, mottled sand

Subsoil:
9 to 14 inches—dark reddish brown and dark brown, mottled, very friable sand
14 to 29 inches—yellowish brown, mottled, loose sand

Substratum:
29 to 80 inches—very pale brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, at a depth of 0.5 foot to 1.5 feet at some time from October through May
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

Au Gres soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
- The excessively drained Grayling soils
- The very poorly drained Deford soils

Similar inclusions:
- Soils that are moderately well drained
- Soils that do not have a dark reddish brown or dark brown subsoil

Use and Management

Dominant land use: Woodland
Other uses: Cropland, pasture

Cropland

Major management concerns: Seasonal wetness, soil blowing, nutrient and pesticide loss
Management considerations:
- Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing. Maintaining a permanent plant cover also helps to control soil blowing.
- Increasing the content of organic matter in the root zone may increase the ability of the soil to hold water, nutrients, and pesticides and can minimize the pollution of ground water.
- The nutrients in manure and fertilizer applications should not exceed the requirements of the plants.
- Subsurface drains can reduce the wetness if a suitable outlet is available.

Pasture

Major management concerns: Seasonal droughtiness, seasonal wetness, overgrazing
Management considerations:
- Proper stocking rates, uniform distribution of grazing, deferred grazing, and a planned grazing system help to keep the pasture in good condition.
- Applying lime and fertilizer according to the results of soil tests can help to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, windthrow hazard, plant competition, seedling mortality, seasonal wetness
Management considerations:
- The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen.
- Trees that can withstand seasonal wetness should be selected for planting.
- Planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
- Carefully managed reforestation helps to control undesirable understory plants.
- Special harvest methods may be needed to control undesirable plants.

Building sites

Major management concerns: Cutbanks caving, seasonal wetness
Management considerations:
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
- Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
- Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Rapid permeability, seasonal wetness
Management considerations:
- The poor filtering capacity of this soil can result in the pollution of ground water.
- Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
- Mounding or adding suitable fill material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: IVw
Woodland ordination symbol: 6W
Michigan soil management group: 5b

19—Leafriver muck

Setting

Landform: Lake plains, outwash plains, and moraines
Shape of areas: Linear or irregular
Size of areas: 5 to 100 acres

Typical Profile

Surface layer:
0 to 10 inches—black muck
10 to 14 inches—black sand
14 to 35 inches—dark brownish gray, loose sand

Substratum:
35 to 60 inches—dark gray sand
60 to 80 inches—brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Moderate
Drainage class: Very poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from November through July
Surface runoff: Very slow or ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: High

Composition

Leafriver soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The moderately well drained Croswell soils
- The somewhat poorly drained Au Gres soils

Similar inclusions:
- Soils that have a thinner organic layer
- Soils that have a thicker organic layer

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition, seasonal wetness
Management considerations:
- The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
- Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
- Landing sites generally can be used only during the driest time of the year.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
- Special harvest methods may be needed to control undesirable plants.
- Carefully managed reforestation helps to control undesirable understory plants.
- Because of wetness, severe seedling mortality, and plant competition, trees are generally not planted on this soil.

Building sites

Major management concerns: Ponding
- Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Ponding
Management considerations:
- Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: 2W
Michigan soil management group: 5c

25B—Kent sandy loam, 2 to 6 percent slopes

Setting

Landform: Till plains
Shape of areas: Irregular
Size of areas: 5 to 120 acres

Typical Profile

Surface layer:
0 to 8 inches—very dark grayish brown sandy loam

Subsoil:
8 to 14 inches—dark brown, firm clay and grayish brown, firm loam
14 to 26 inches—reddish brown, firm clay
26 to 40 inches—dark brown, mottled, firm clay

Substratum:
40 to 80 inches—brown clay

Soil Properties and Qualities

Permeability: Slow
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 2.0 to 3.5 feet at some time from November through May
Surface runoff: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: High
Potential for frost action: Moderate

Composition

Kent soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Selkirk soils
• The moderately well drained, sandy over loamy Morganlake soils
• The poorly drained Sims soils

Similar inclusions:
• Soils that have a sandy substratum
• Soils that have less clay in the subsoil
• Soils that have a surface layer of loam
• Soils that are eroded and have a surface layer of clay loam

Use and Management

Dominant land use: Cropland
Other uses: Pasture, woodland

Cropland

Major management concerns: Water erosion, tilth in the surface layer, soil compaction, restricted permeability
Management considerations:
• A system of conservation tillage that leaves crop residue on the surface helps to control water erosion, helps to prevent crusting during periods of heavy rainfall, and increases the rate of water infiltration.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.

Pasture

Major management concerns: Compaction
Management considerations:
• Proper stocking rates, uniform distribution of grazing, and a planned grazing system help to keep the pasture in good condition.
• Restricted grazing during wet periods helps to prevent compaction and poor tilth.

Woodland

Major management concerns: Plant competition, equipment limitations, windthrow hazard
Management considerations:
• Carefully managed reforestation helps to control undesirable understory plants.
• If trees are planted, site preparation is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.
• Because of the restricted permeability and the sticky and plastic subsoil, logging roads should be graveled and in some areas landings should be stabilized.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Building sites

Major management concerns: Shrink-swell, seasonal wetness
Management considerations:
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.

Septic tank absorption fields

Major management concerns: Restricted permeability, seasonal wetness
Management considerations:
• Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.

• Filling or mounding with suitable material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 8C
Michigan soil management group: 1a

25C—Kent sandy loam, 6 to 12 percent slopes

Setting

Landform: Till plains and moraines
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Surface layer:
0 to 8 inches—very dark grayish brown sandy loam

Subsoil:
8 to 14 inches—dark brown, firm clay and grayish brown, firm loam
14 to 26 inches—reddish brown, firm clay
26 to 40 inches—dark brown, mottled, firm clay

Substratum:
40 to 80 inches—brown clay

Soil Properties and Qualities

Permeability: Slow
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 2.0 to 3.5 feet at some time from November through May
Surface runoff: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: High
Potential for frost action: Moderate

Composition

Kent soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained, sandy over loamy Morganlake soils
• The somewhat poorly drained Selkirk soils
• The poorly drained Sims soils

Similar inclusions:
• Soils that have a sandy substratum
• Soils that have less clay in the subsoil
• Soils that are eroded and have a surface layer of clay loam

Use and Management

Dominant land use: Cropland
Other uses: Pasture, woodland

Cropland

Major management concerns: Water erosion, soil compaction, tilth in the surface layer, restricted permeability
Management considerations:
• A system of conservation tillage that leaves crop residue on the surface helps to control water erosion, helps to prevent crusting during periods of heavy rainfall, and increases the rate of water infiltration.
• Shaping and maintaining grassed waterways promote the safe removal of runoff from the fields.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.

Pasture

Major management concerns: Compaction
Management considerations:
• Proper stocking rates, uniform distribution of grazing, and a planned grazing system help to keep the pasture in good condition.
• Restricted grazing during wet periods helps to prevent compaction and poor tilth.

Woodland

Major management concerns: Plant competition, equipment limitations, windthrow hazard
Management considerations:
• Carefully managed reforestation helps to control undesirable understory plants.
• If trees are planted, site preparation is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.
• Because of the restricted permeability and the sticky and plastic subsoil, logging roads should be graveled and in some areas landings should be stabilized.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced

and by such harvest methods as selective cutting and strip cutting.

Building sites

Major management concerns: Shrink-swell, slope, seasonal wetness
Management considerations:
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.

Septic tank absorption fields

Major management concerns: Restricted permeability, slope, seasonal wetness
Management considerations:
• Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 8C
Michigan soil management group: 1a

26B—Cublake sand, 0 to 6 percent slopes

Setting

Landform: Lake plains and outwash plains
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 5 inches—brown sand

Subsoil:
5 to 10 inches—dark brown, very friable sand
10 to 13 inches—dark yellowish brown, very friable sand
13 to 24 inches—brownish yellow, loose sand

Substratum:
24 to 45 inches—pale brown and very pale brown, mottled sand
45 to 80 inches—brown, stratified, mottled very fine sandy loam and silt loam

Soil Properties and Qualities

Permeability: Rapid in the sandy part and moderately slow in the loamy part
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 2.0 to 3.5 feet at some time from October through May
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Cublake soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Graycalm soils
• The very poorly drained Wakeley soils

Similar inclusions:
• Soils that have more clay in the substratum
• Soils that have a surface layer of loamy sand
• Soils that do not have mottles in the subsoil and the substratum

Use and Management

Dominant land use: Woodland
Other uses: Cropland, pasture

Cropland

Major management concerns: Low content of organic matter, soil blowing, seasonal droughtiness, nutrient and pesticide loss
Management considerations:
• Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing. Maintaining a permanent plant cover also helps to control soil blowing.
• A system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture and in reducing the hazard of soil blowing.

• Increasing the content of organic matter in the root zone may increase the ability of the soil to hold water, nutrients, and pesticides and can minimize the pollution of ground water.
• The nutrients in manure and fertilizer applications should not exceed the requirements of the plants.
• Including green manure crops in the cropping sequence, applying a system of conservation tillage, and properly managing crop residue increase the content of organic matter.

Pasture

Major management concerns: Seasonal droughtiness, overgrazing
Management considerations:
• Proper stocking rates, uniform distribution of grazing, and a planned grazing system help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests can help to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Equipment limitations, seedling mortality, plant competition, windthrow hazard, seasonal droughtiness
Management considerations:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.

Building sites

Major management concerns: Cutbanks caving, seasonal wetness
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.

Septic tank absorption fields

Major management concerns: Rapid permeability, seasonal wetness, restricted permeability
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
• Filling or mounding with suitable fill material helps to raise the absorption field above the water table.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 7A
Michigan soil management group: 5a

27A—Tacoda sand, 0 to 3 percent slopes

Setting

Landform: Lake plains
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 15 inches—light gray, mottled sand

Subsoil:
15 to 23 inches—dark brown, mottled, friable sand
23 to 45 inches—very pale brown, light yellowish brown, and brown, mottled, loose sand

Substratum:
45 to 80 inches—dark brown and brown, mottled silty clay

Soil Properties and Qualities

Permeability: Rapid in the sandy part and very slow in the loamy part
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched at a depth of 0.5 foot to 1.5 feet at some time from October through May

Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

Tacoda soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
- The very poorly drained Wakeley soils

Similar inclusions:
- Soils that are moderately well drained
- Soils that have no clay in the substratum
- Soils that have a cemented subsoil

Use and Management

Dominant land use: Woodland
Other uses: Pasture

Pasture

Major management concerns: Seasonal droughtiness, seasonal wetness
Management considerations:
- Proper stocking rates, a planned grazing system, deferred grazing during wet periods, and restricted use during dry periods help to keep the pasture in good condition.
- Applying lime and fertilizer according to the results of soil tests can help to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, plant competition, seedling mortality, windthrow hazard, seasonal wetness
Management considerations:
- The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
- Carefully managed reforestation helps to control undesirable understory plants.
- Special harvest methods may be needed to control undesirable plants.
- Trees that can withstand seasonal wetness should be selected for planting.
- Planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Building sites

Major management concerns: Cutbanks caving, seasonal wetness
Management considerations:
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
- Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.
- Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.

Septic tank absorption fields

Major management concerns: Rapid permeability, restricted permeability, seasonal wetness
Management considerations:
- The poor filtering capacity of this soil can result in the pollution of ground water.
- Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
- Filling or mounding with suitable material helps to raise the absorption field above the water table.
- Backfilling the trenches with porous material helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: IVw
Woodland ordination symbol: 4W
Michigan soil management group: 5b

28B—East Lake sand, 0 to 6 percent slopes

Setting

Landform: Outwash plains and lake terraces
Shape of areas: Irregular
Size of area: 220 acres

Typical Profile

Surface layer:
0 to 4 inches—black sand

Subsurface layer:
4 to 7 inches—grayish brown sand

Subsoil:
7 to 20 inches—dark brown and strong brown, very friable loamy sand

20 to 30 inches—strong brown, very friable sand

Substratum:
30 to 80 inches—brown, stratified sand and very gravelly loamy coarse sand

Soil Properties and Qualities

Permeability: Rapid in the sandy surface layer and subsoil and very rapid in the substratum
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

East Lake soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The excessively drained Grayling soils

Similar inclusions:
- Soils that have a loamy layer in the subsoil
- Soils that are moderately well drained

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
- Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.

Building sites

Major management concerns: Cutbanks caving
Management considerations:
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.

Septic tank absorption fields

Major management concerns: Rapid permeability
Management considerations:
- The poor filtering capacity of this soil can result in the pollution of ground water.
- Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 2S
Michigan soil management group: 5a

39B—Glennie loamy sand, 0 to 6 percent slopes

Setting

Landform: Ground moraines
Shape of areas: Irregular
Size of areas: 10 to 20 acres

Typical Profile

Organic mat:
0 to 2 inches—black, partially decomposed forest litter

Surface layer:
2 to 3 inches—black loamy sand

Subsurface layer:
3 to 7 inches—grayish brown loamy sand

Subsoil:
7 to 11 inches—dark brown, friable sandy loam
11 to 20 inches—strong brown, friable loamy sand
20 to 40 inches—brown, firm, brittle loamy sand and reddish brown, firm, brittle loam
40 to 46 inches—reddish brown, mottled, very firm, brittle sandy clay loam and brown, mottled, very firm, brittle sandy loam
46 to 56 inches—dark reddish brown, mottled, very firm sandy clay loam
56 to 85 inches—reddish brown, very firm sandy clay loam

Substratum:
85 to 99 inches—reddish brown sandy clay loam

Soil Properties and Qualities

Permeability: Rapid in the loamy sand part and very slow in the loamy and clayey parts
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 2.5 to 3.5 feet at some time from November through May

Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

Glennie soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The very poorly drained Wakeley soils

Similar inclusions:
- Soils that are well drained
- Soils that have 20 inches of sand at the surface

Use and Management

Dominant land use: Woodland
Other uses: Pasture, cropland

Cropland

Major management concerns: Soil blowing, droughtiness, nutrient and pesticide loss, seasonal wetness
Management considerations:
- Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing. Maintaining a permanent plant cover also helps to control soil blowing.
- The rate of water infiltration can be increased by growing cover crops, leaving crop residue on the surface, and regularly adding other organic material.
- Growing grasses and legumes in rotation can reduce nutrient losses, improve soil structure, and provide nitrogen for use by succeeding crops.
- Wetness may delay soil preparation and planting in the spring.

Pasture

Major management concerns: Overgrazing, seasonal wetness
Management considerations:
- Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.

Woodland

Major management concerns: Equipment limitations, windthrow hazard, plant competition
Management considerations:
- Skidders should not be used during wet periods, when ruts form easily.
- Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
- Carefully managed reforestation helps to control undesirable understory plants.
- Special harvest methods may be needed to control undesirable plants.
- If trees are planted, site preparation is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.

Building sites

Major management concerns: Cutbanks caving, seasonal wetness
Management considerations:
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
- Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Seasonal wetness, restricted permeability
Management considerations:
- Filling or mounding with suitable material helps to raise the absorption field above the water table.
- Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability.
- Backfilling the trenches with porous material helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: 5D
Michigan soil management group: 4/2a-f

39C—Glennie loamy sand, 6 to 12 percent slopes

Setting

Landform: Ground moraines
Shape of areas: Irregular
Size of areas: 153 acres

Typical Profile

Organic mat:
0 to 2 inches—black, partially decomposed forest litter

Surface layer:
2 to 3 inches—black loamy sand

Subsurface layer:
3 to 7 inches—grayish brown loamy sand

Subsoil:
7 to 11 inches—dark brown, friable sandy loam
11 to 20 inches—strong brown, friable loamy sand
20 to 40 inches—brown, firm, brittle loamy sand and reddish brown, firm, brittle loam
40 to 46 inches—reddish brown, mottled, very firm, brittle sandy clay loam and brown, mottled, very firm, brittle sandy loam
46 to 56 inches—dark reddish brown, mottled, very firm sandy clay loam
56 to 85 inches—reddish brown, very firm sandy clay loam

Substratum:
85 to 99 inches—reddish brown sandy clay loam

Soil Properties and Qualities

Permeability: Rapid in the sandy part and very slow in the loamy and clayey parts
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 2.5 to 3.5 feet at some time from November through May
Surface runoff: Slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

Glennie soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Graycalm soils
• The very poorly drained Wakeley soils

Similar inclusions:
• Soils that are well drained

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, windthrow hazard, plant competition
Management considerations:
• Skidders should not be used during wet periods, when ruts form easily.
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.
• If trees are planted, site preparation is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.

Building sites

Major management concerns: Cutbanks caving, seasonal wetness, slope
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.
• Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.

Septic tank absorption fields

Major management concerns: Restricted permeability, seasonal wetness, slope
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 5D
Michigan soil management group: 4/2a-f

40A—Sprinkler sandy loam, 0 to 3 percent slopes

Setting

Landform: Ground moraines
Shape of areas: Irregular
Size of areas: 25 to 60 acres

Typical Profile

Surface layer:
0 to 5 inches—very dark gray sandy loam

Subsurface layer:
5 to 13 inches—brown, mottled sandy loam

Subsoil:
13 to 28 inches—brown, mottled, firm sandy loam and loam
28 to 44 inches—dark brown and brown, mottled, firm loam

Substratum:
44 to 80 inches—brown, mottled loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, at a depth of 0.5 foot to 1.5 feet at some time from October through May
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Moderate
Potential for frost action: High

Composition

Sprinkler soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Glennie soils

Similar inclusions:
• Soils that have more sand in the surface layer

Use and Management

Dominant land use: Woodland
Other uses: Cropland, pasture

Cropland

Major management concerns: Seasonal wetness, soil blowing, nutrient and pesticide loss
Management considerations:
• Most adapted crops can be grown if an adequate drainage system is installed.
• The nutrients in manure and fertilizer applications should not exceed the requirements of the plants.
• Conservation tillage, crop residue management, windbreaks, and cover crops help to control soil blowing.

Pasture

Major management concerns: Overgrazing, seasonal wetness
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition, seasonal wetness
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Special harvest methods may be needed to control undesirable plants.
• Carefully managed reforestation helps to control undesirable understory plants.
• If trees are planted, site preparation is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.

Building sites

Major management concerns: Seasonal wetness, shrink-swell
Management considerations:
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Major management concerns: Seasonal wetness, restricted permeability
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 3W
Michigan soil management group: 2.5b

47D—Graycalm sand, 6 to 18 percent slopes

Setting

Landform: Outwash plains and stream terraces
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Surface layer:
0 to 4 inches—black sand

Subsoil:
4 to 16 inches—strong brown, friable sand
16 to 45 inches—yellowish brown, brownish yellow, and yellow, very friable sand
45 to 80 inches—very pale brown, loose sand with bands of strong brown loamy sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Graycalm soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Morganlake soils

Similar inclusions:
• Soils that have bands of gravelly sand in the subsoil
• Soils that have calcareous sand and gravel below a depth of 60 inches
• Soils that do not have bands of loamy sand in the subsoil

Use and Management

Land use: Woodland

Woodland

Major management concerns: Erosion hazard, equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
• Because loose sand and the slope can hinder the traction of wheeled equipment, skid roads should be built on the contour or on the gentler slopes.
• The grade should be kept as low as possible.
• Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures. Building logging roads on the contour or on the gentler slopes and seeding logging roads, skid roads, and landings after the trees are logged also help to prevent excessive soil loss.

Building sites

Major management concerns: Cutbanks caving, slope
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.

Septic tank absorption fields

Major management concerns: Rapid permeability, slope
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.

• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 6S
Michigan soil management group: 5a

47F—Graycalm sand, 18 to 45 percent slopes

Setting

Landform: Escarpments on stream terraces
Shape of areas: Linear
Size of areas: 5 to 25 acres

Typical Profile

Surface layer:
0 to 4 inches—black sand

Subsoil:
4 to 16 inches—strong brown, friable sand
16 to 45 inches—yellowish brown, brownish yellow, and yellow, very friable sand
45 to 80 inches—very pale brown, loose sand with bands of strong brown loamy sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Rapid
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Graycalm soil and similar soils: 95 to 100 percent
Contrasting inclusions: 0 to 5 percent

Inclusions

Contrasting inclusions:
• The well drained, sandy over loamy Menominee soils

Similar inclusions:
• Soils that do not have bands of loamy sand in the substratum

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, erosion hazard, seedling mortality, seasonal droughtiness, slope
Management considerations:
• Because loose sand and the slope can hinder the traction of wheeled equipment, skid roads should be built on the contour or on the gentler slopes.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• Ordinary crawler tractors and rubber-tired skidders cannot be operated safely because of the slope. As a result, special logging methods, such as yarding the logs with a cable, may be needed.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures. Building logging roads on the contour or on the gentler slopes and seeding logging roads, skid roads, and landings after the trees are logged also help to prevent excessive soil loss.
• Planting special nursery stock or containerized seedlings can reduce the seedling mortality rate. Planting when the soil is moist can also reduce the seedling mortality rate.

Building sites

Major management concerns: Slope
Management considerations:
• Because of the slope, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Slope
Management considerations:
• Because of the slope, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 6R
Michigan soil management group: 5a

53B—Negwegon silt loam, 2 to 6 percent slopes

Setting

Landform: Lake plains
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Surface layer:
0 to 6 inches—very dark grayish brown silt loam

Subsoil:
6 to 10 inches—dark brown, firm clay and pale brown, firm silt loam
10 to 34 inches—dark brown and strong brown, firm clay

Substratum:
34 to 80 inches—light brown, mottled silty clay loam

Soil Properties and Qualities

Permeability: Very slow
Available water capacity: High
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 2.0 to 3.5 feet at some time from November through May
Surface runoff: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Slight
Shrink-swell potential: High
Potential for frost action: Moderate

Composition

Negwegon soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained, sandy over loamy Skeel soils
• The poorly drained Springport soils

Similar inclusions:
• Soils that have sandy layers below a depth of 60 inches
• Soils that have a surface layer of loamy sand
• Soils that have clay loam till below a depth of 60 inches

Use and Management

Dominant land use: Cropland
Other uses: Pasture, woodland

Cropland

Major management concerns: Water erosion, seasonal wetness, restricted permeability, tilth in the surface layer, soil compaction, nutrient and pesticide loss
Management considerations:
• Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to prevent excessive soil loss.
• Most adapted crops can be grown if an adequate drainage system is installed.
• Because of the restricted permeability, subsurface drains should be narrowly spaced.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.
• Conservation tillage systems, contour farming, cover crops, and sod-based rotations can minimize the detachment and loss of nutrients associated with sediment and thus help to prevent the loss of solid-phase nitrogen and phosphorus.

Pasture

Major management concerns: Seasonal wetness, compaction
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Restricted grazing during wet periods helps to prevent compaction and poor tilth.

Woodland

Major management concerns: Equipment limitations, windthrow hazard, plant competition, seasonal wetness
Management considerations:
• Because of the restricted permeability and the sticky and plastic subsoil, logging roads should be graveled and in some areas landings should be stabilized.
• Skidders should not be used during wet periods, when ruts form easily.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Carefully managed reforestation helps to control undesirable understory plants.

• Special harvest methods may be needed to control undesirable plants.
• Species preference can be managed by selective cutting.

Building sites

Major management concerns: Shrink-swell, seasonal wetness
Management considerations:
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.
• Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Restricted permeability, seasonal wetness
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 3L
Michigan soil management group: 1a

53C—Negwegon silt loam, 6 to 12 percent slopes

Setting

Landform: Ridges and knolls on lake plains
Shape of areas: Irregular
Size of areas: 10 to 50 acres

Typical Profile

Surface layer:
0 to 6 inches—very dark grayish brown silt loam

Subsoil:
6 to 10 inches—dark brown, firm clay and pale brown, firm silt loam
10 to 34 inches—dark brown and brown, firm clay

Substratum:
34 to 80 inches—light brown, mottled silty clay loam

Soil Properties and Qualities

Permeability: Very slow
Available water capacity: High
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 2.0 to 3.5 feet at some time from November through May
Surface runoff: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Slight
Shrink-swell potential: High
Potential for frost action: Moderate

Composition

Negwegon soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The moderately well drained, sandy over loamy Skeel soils

Similar inclusions:
• Soils that are well drained
• Soils that have a surface layer of loamy sand
• Soils that have clay loam till below a depth of 60 inches

Use and Management

Dominant land use: Cropland
Other uses: Pasture, woodland

Cropland

Major management concerns: Water erosion, seasonal wetness, restricted permeability, tilth in the surface layer, soil compaction, nutrient and pesticide loss
Management considerations:
• Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to prevent excessive soil loss.
• Growing grasses and legumes for pasture or hay is effective in controlling erosion.
• Shaping and maintaining grassed waterways promote the safe removal of runoff from the fields.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.
• Minimizing tillage and tilling and harvesting at the

proper soil moisture content help to prevent excessive compaction and maintain tilth.
• Conservation tillage systems, contour farming, cover crops, and sod-based rotations can minimize the detachment and loss of nutrients associated with sediment and thus help to prevent the loss of solid-phase nitrogen and phosphorus.
• Because of the restricted permeability, subsurface drains should be narrowly spaced.

Pasture

Major management concerns: Seasonal wetness, compaction
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Restricted grazing during wet periods helps to prevent compaction and poor tilth.

Woodland

Major management concerns: Equipment limitations, windthrow hazard, plant competition, seasonal wetness
Management considerations:
• Because of the restricted permeability and the sticky and plastic subsoil, logging roads should be graveled and in some areas landings should be stabilized.
• Skidders should not be used during wet periods, when ruts form easily.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.
• Species preference can be managed by selective cutting.

Building sites

Major management concerns: Shrink-swell, seasonal wetness, slope
Management considerations:
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.
• Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.
• Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Restricted permeability, seasonal wetness, slope
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 3L
Michigan soil management group: 1a

54A—Algonquin silt loam, 0 to 3 percent slopes

Setting

Landform: Lake plains
Shape of areas: Irregular
Size of areas: 5 to 20 acres

Typical Profile

Surface layer:
0 to 7 inches—dark brown, mottled silt loam

Subsoil:
7 to 11 inches—reddish brown, mottled, firm silty clay
11 to 14 inches—reddish brown, mottled, firm silty clay loam
14 to 80 inches—light reddish brown, mottled, firm silty clay

Soil Properties and Qualities

Permeability: Very slow
Available water capacity: High
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched at a depth of 0.5 foot to 1.5 feet at some time from October through May
Surface runoff: Slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: High
Potential for frost action: High

Composition

Algonquin soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Negwegon soils
• The somewhat poorly drained, sandy over loamy Allendale soils

Similar inclusions:
• Soils that have a thin surface layer of sandy loam

Use and Management

Dominant land use: Cropland
Other uses: Pasture, woodland

Cropland

Major management concerns: Seasonal wetness, restricted permeability, soil compaction, tilth in the surface layer
Management considerations:
• Subsurface drains can reduce the wetness if a suitable outlet is available.
• Because of the restricted permeability, subsurface drains should be narrowly spaced.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.

Pasture

Major management concerns: Compaction, seasonal wetness
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Restricted grazing during wet periods helps to prevent compaction and poor tilth.

Woodland

Major management concerns: Equipment limitations, windthrow hazard, plant competition, seedling mortality, seasonal wetness
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Because of the restricted permeability and the sticky and plastic subsoil, logging roads should be graveled and in some areas landings should be stabilized.
• Skidders should not be used during wet periods, when ruts form easily.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.
• Trees that can withstand seasonal wetness should be selected for planting.

Building sites

Major management concerns: Shrink-swell, seasonal wetness
Management considerations:
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Seasonal wetness, restricted permeability
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 6W
Michigan soil management group: 1b

55—Springport clay loam

Setting

Landform: Lake plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 20 acres

Typical Profile

Surface layer:
0 to 8 inches—very dark gray clay loam

Subsoil:
8 to 12 inches—grayish brown, mottled, firm clay
12 to 27 inches—reddish brown, mottled, firm silty clay

Substratum:
27 to 80 inches—reddish brown, mottled silty clay

Soil Properties and Qualities

Permeability: Very slow
Available water capacity: High
Drainage class: Poorly drained
Seasonal high water table: Perched 1 foot above to 1 foot below the surface at some time from October through June
Surface runoff: Very slow or ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: High
Potential for frost action: High

Composition

Springport soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The moderately well drained Negwegon soils
- The somewhat poorly drained Algonquin soils

Similar inclusions:
- Soils that have a mucky surface layer

Use and Management

Dominant land use: Woodland
Other uses: Pasture, cropland

Cropland

Major management concerns: Seasonal wetness, tilth in the surface layer, soil compaction, restricted permeability, ponding
Management considerations:
- Shallow surface ditches help to remove surface water after heavy rains.
- Subsurface drains can reduce the wetness if a suitable outlet is available.
- Because of the restricted permeability, subsurface drains should be narrowly spaced.
- Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.
- Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.

Pasture

Major management concerns: Seasonal wetness, compaction
Management considerations:
- Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
- Restricted grazing during wet periods helps to prevent compaction and poor tilth.
- Hay and pasture plants that can withstand periodic inundation and seasonal wetness should be seeded.

Woodland

Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition
Management considerations:
- The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
- Because of the restricted permeability and the sticky and plastic subsoil, logging roads should be graveled and in some areas landings should be stabilized.
- Skidders should not be used during wet periods, when ruts form easily.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
- Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.

Building sites

Major management concerns: Ponding
Management considerations:
- Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Ponding
Management considerations:
- Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 6W
Michigan soil management group: 1c

56C—Nester loam, 6 to 12 percent slopes

Setting

Landform: Till plains and moraines
Shape of areas: Irregular
Size of area: 51 acres

Typical Profile

Surface layer:
0 to 9 inches—very dark grayish brown loam

Subsoil:
9 to 19 inches—brown sandy loam and reddish brown, mottled, firm clay loam
19 to 40 inches—reddish brown, mottled, firm clay loam

Substratum:
40 to 80 inches—light reddish brown clay loam

Soil Properties and Qualities

Permeability: Slow
Available water capacity: High
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 2.5 to 3.5 feet at some time from November through May
Surface runoff: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Slight
Shrink-swell potential: Moderate
Potential for frost action: Moderate

Composition

Nester soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained, sandy over loamy Morganlake soils
• The somewhat poorly drained Kawkawlin soils

Similar inclusions:
• Soils that do not have mottles in the subsoil
• Soils that have a surface layer of sandy loam

Use and Management

Dominant land use: Woodland
Other uses: Cropland, pasture

Cropland

Major management concerns: Water erosion, soil compaction, tilth in the surface layer, seasonal wetness, nutrient and pesticide loss, restricted permeability
Management considerations:
• Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to prevent excessive soil loss.
• Shaping and maintaining grassed waterways promote the safe removal of runoff from the fields.
• Conservation tillage systems, contour farming, cover crops, and sod-based rotations can minimize the detachment and loss of nutrients associated with sediment and thus help to prevent the loss of solid-phase nitrogen and phosphorus.
• Most adapted crops can be grown if an adequate drainage system is installed.
• Because of the restricted permeability, subsurface drains should be narrowly spaced.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.

Pasture

Major management concerns: Seasonal wetness, compaction, overgrazing
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Restricted grazing during wet periods helps to prevent compaction and poor tilth.
• Applying lime and fertilizer according to the results of soil tests can help to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Equipment limitations, plant competition, seasonal wetness
Management considerations:
• Because of low strength, suitable surfacing material is needed on year-round logging roads and landings.

• Skidders should not be used during wet periods, when ruts form easily.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.

Building sites

Major management concerns: Seasonal wetness, shrink-swell, slope
Management considerations:
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.
• Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.

Septic tank absorption fields

Major management concerns: Seasonal wetness, restricted permeability, slope
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 3L
Michigan soil management group: 1.5a

57B—Kawkawlin loam, 1 to 4 percent slopes

Setting

Landform: Till plains and moraines
Shape of areas: Irregular
Size of areas: 5 to 150 acres

Typical Profile

Surface layer:
0 to 10 inches—very dark grayish brown loam

Subsoil:
10 to 15 inches—grayish brown, friable fine sandy loam and dark brown, mottled, friable clay loam
15 to 29 inches—dark yellowish brown, mottled, friable clay loam

Substratum:
29 to 44 inches—reddish brown, mottled clay loam
44 to 80 inches—brown clay loam

Soil Properties and Qualities

Permeability: Slow
Available water capacity: High
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched at a depth of 0.5 foot to 1.5 feet at some time from October through May
Surface runoff: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Slight
Shrink-swell potential: Moderate
Potential for frost action: High

Composition

Kawkawlin soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The poorly drained Sims soils
• The moderately well drained Nester soils

Similar inclusions:
• Soils that have a surface layer of loamy sand
• Soils that have sandy layers below a depth of 60 inches

Use and Management

Dominant land use: Cropland
Other uses: Woodland, pasture

Cropland

Major management concerns: Water erosion, seasonal wetness, tilth in the surface layer, nutrient and pesticide loss
Management considerations:
• Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to control runoff and water erosion.
• Subsurface drains can reduce the wetness if a suitable outlet is available.
• Shallow surface ditches help to remove surface water after heavy rains.

• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.
• Conservation tillage systems, contour farming, cover crops, and sod-based rotations can minimize the detachment and loss of nutrients associated with sediment and thus help to prevent the loss of solid-phase nitrogen and phosphorus.

Pasture

Major management concerns: Seasonal wetness, overgrazing, compaction
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Restricted grazing during wet periods helps to prevent compaction and poor tilth.
• Applying lime and fertilizer according to the results of soil tests can help to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, windthrow hazard, plant competition, seasonal wetness
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Skidders should not be used during wet periods, when ruts form easily.
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Trees that can withstand seasonal wetness should be selected for planting.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.

Building sites

Major management concerns: Seasonal wetness, shrink-swell
Management considerations:
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Major management concerns: Seasonal wetness, restricted permeability
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 3W
Michigan soil management group: 1.5b

58A—Wakeley-Allendale complex, 0 to 3 percent slopes

Setting

Landform: Lake plains
Slope range: Wakeley—0 to 2 percent; Allendale—0 to 3 percent
Shape of areas: Irregular
Size of areas: 25 to 200 acres

Typical Profile

Wakeley

Surface layer:
0 to 5 inches—black muck

Substratum:
5 to 16 inches—dark grayish brown and grayish brown, mottled sand
16 to 27 inches—brown, mottled sand
27 to 80 inches—reddish brown and pinkish gray, mottled clay

Allendale

Surface layer:
0 to 6 inches—very dark brown loamy sand

Subsurface layer:
6 to 8 inches—light brownish gray, mottled sand

Subsoil:
8 to 18 inches—dark brown and strong brown, mottled, friable sand
18 to 32 inches—pale brown, mottled, loose sand
32 to 36 inches—reddish brown, mottled, very firm clay

Substratum:
36 to 80 inches—brown and weak red, mottled clay

Soil Properties and Qualities

Permeability: Rapid in the sandy part and very slow in the clayey part
Available water capacity: Moderate
Drainage class: Wakeley—very poorly drained; Allendale—somewhat poorly drained
Seasonal high water table: Wakeley—perched 1 foot above to 1 foot below the surface at some time from October through May; Allendale—perched at a depth of 0.5 foot to 1.5 feet at some time from October through May
Surface runoff: Wakeley—very slow or ponded; Allendale—very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: High
Potential for frost action: Moderate

Composition

Wakeley soil and similar soils: 50 to 60 percent
Allendale soil and similar soils: 40 to 50 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
- The poorly drained, clayey Springport soils
- The somewhat poorly drained, clayey Algonquin soils

Similar inclusions:
- Soils that have thinner layers of sand
- Soils that have a thicker surface layer of muck

Use and Management

Dominant land use: Woodland
Other use: Pasture

Pasture

Major management concerns: Seasonal wetness, overgrazing
Management considerations:
- Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
- Hay and pasture plants that can withstand periodic inundation and seasonal wetness should be seeded.
- Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition, seasonal wetness
Management considerations:
- The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
- Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
- Carefully managed reforestation helps to control undesirable understory plants.
- Special harvest methods may be needed to control undesirable plants.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
- Trees that can withstand seasonal wetness should be selected for planting on the Allendale soil.
- Because of wetness, seedling mortality, and plant competition, trees are generally not planted on the Wakeley soil.

Building sites

Major management concerns: Wakeley—ponding; Allendale—cutbanks caving, seasonal wetness, shrink-swell
Management considerations:
- Because cutbanks in areas of the Allendale soil are not stable and are subject to caving, trench walls should be reinforced.
- In areas of the Allendale soil, buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
- Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling of the Allendale soil.
- Because of ponding, the Wakeley soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Wakeley—ponding; Allendale—rapid permeability, restricted permeability, seasonal wetness
Management considerations:
• The poor filtering capacity of the Allendale soil can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
• Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability in areas of the Allendale soil.
• In areas of the Allendale soil, filling or mounding with suitable material helps to raise the absorption field above the water table.
• Because of ponding, the Wakeley soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: Wakeley—3W; Allendale—4W
Michigan soil management group: Wakeley—4/1c; Allendale—4/1b

59B—Algonquin-Springport complex, 0 to 6 percent slopes

Setting

Landform: Lake plains
Slope range: Algonquin—0 to 6 percent; Springport—0 to 2 percent
Shape of areas: Irregular
Size of areas: 25 acres

Typical Profile

Algonquin

Surface layer:
0 to 7 inches—dark brown, mottled silt loam

Subsoil:
7 to 11 inches—reddish brown, mottled, firm silty clay
11 to 14 inches—reddish brown, mottled, firm silty clay loam
14 to 80 inches—light reddish brown, mottled, firm silty clay

Springport

Surface layer:
0 to 8 inches—very dark gray clay loam

Subsoil:
8 to 12 inches—grayish brown, mottled, firm clay
12 to 27 inches—reddish brown, mottled, firm silty clay

Substratum:
27 to 80 inches—reddish brown, mottled silty clay

Soil Properties and Qualities

Permeability: Very slow
Available water capacity: High
Drainage class: Algonquin—somewhat poorly drained; Springport—poorly drained
Seasonal high water table: Algonquin—perched at a depth of 0.5 foot to 1.5 feet at some time from October through May; Springport—perched 1 foot above to 1 foot below the surface at some time from October through June
Surface runoff: Algonquin—medium; Springport—very slow or ponded
Flooding: None
Hazard of water erosion: Algonquin—moderate; Springport—slight
Hazard of soil blowing: Slight
Shrink-swell potential: High
Potential for frost action: High

Composition

Algonquin soil and similar soils: 60 to 70 percent
Springport soil and similar soils: 30 to 40 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, sandy over clayey Allendale soils
• The very poorly drained, sandy over clayey Wakeley soils

Similar inclusions:
• Soils that have a mucky surface layer

Use and Management

Dominant land use: Woodland
Other uses: Cropland, pasture

Cropland

Major management concerns: Algonquin—seasonal wetness, restricted permeability, soil compaction, tilth in the surface layer, erosion hazard; Springport—seasonal wetness, restricted permeability, soil compaction, tilth in the surface layer, ponding
Management considerations:
• Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops,

and crop residue management help to control runoff and water erosion.
• Both surface and subsurface drainage systems are needed to reduce the wetness.
• Because of the restricted permeability, subsurface drains should be narrowly spaced.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.

Pasture

Major management concerns: Seasonal wetness, compaction
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Restricted grazing during wet periods helps to prevent compaction and poor tilth.
• Hay and pasture plants that can withstand periodic inundation and seasonal wetness should be seeded.

Woodland

Major management concerns: Equipment limitations, windthrow hazard, seedling mortality, plant competition, seasonal wetness
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Because of the restricted permeability and the sticky and plastic subsoil, logging roads should be graveled and in some areas landings should be stabilized.
• Skidders should not be used during wet periods, when ruts form easily.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on the Springport soil.

Building sites

Major management concerns: Algonquin—shrink-swell, seasonal wetness; Springport—shrink-swell, ponding
Management considerations:
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.
• In areas of the Algonquin soil, wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.
• In areas of the Algonquin soil, buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Because of ponding, the Springport soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Algonquin—seasonal wetness, restricted permeability; Springport—ponding
Management considerations:
• In areas of the Algonquin soil, filling or mounding with suitable material helps to raise the absorption field above the water table.
• Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability in areas of the Algonquin soil.
• Because of ponding, the Springport soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 6W
Michigan soil management group: Algonquin—1b; Springport—1c

62A—Allendale loamy sand, 0 to 3 percent slopes

Setting

Landform: Lake plains and till plains
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Surface layer:
0 to 6 inches—very dark brown loamy sand

Subsurface layer:
6 to 8 inches—light brownish gray, mottled sand

Subsoil:
8 to 18 inches—dark brown and strong brown, mottled, friable sand

18 to 32 inches—pale brown, mottled, loose sand
32 to 36 inches—reddish brown, mottled, very firm clay

Substratum:
36 to 80 inches—brown and weak red, mottled clay

Soil Properties and Qualities

Permeability: Rapid in the sandy part and very slow in the clayey part
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched at a depth of 0.5 foot to 1.5 feet at some time from October through May
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: High
Potential for frost action: Moderate

Composition

Allendale soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained, clayey Algonquin soils
- The very poorly drained Wakeley soils

Similar inclusions:
- Soils that have a surface layer of sand

Use and Management

Dominant land use: Woodland
Other uses: Pasture, cropland

Cropland

Major management concerns: Seasonal wetness, soil blowing, nutrient and pesticide loss, low content of organic matter, restricted permeability
Management considerations:
- Subsurface drains can reduce the wetness if a suitable outlet is available.
- Because of the restricted permeability, subsurface drains should be narrowly spaced.
- Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing. Maintaining a permanent plant cover also helps to control soil blowing.
- The nutrients in manure and fertilizer applications should not exceed the requirements of the plants.
- Including green manure crops in the cropping sequence, applying a system of conservation tillage, and properly managing crop residue increase the content of organic matter.

Pasture

Major management concerns: Overgrazing, seasonal wetness
Management considerations:
- Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
- Hay and pasture plants that can withstand periodic inundation and seasonal wetness should be seeded.
- Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Seasonal wetness, equipment limitations, windthrow hazard, plant competition, seedling mortality
Management considerations:
- The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
- Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
- Trees that can withstand seasonal wetness should be selected for planting.
- Carefully managed reforestation helps to control undesirable understory plants.
- Special harvest methods may be needed to control undesirable plants.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
- If trees are planted, site preparation by mechanical or chemical means is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.

Building sites

Major management concerns: Seasonal wetness, shrink-swell, cutbanks caving
Management considerations:
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
- Wetness can be reduced by installing a drainage

system around structures with basements and crawl spaces.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Major management concerns: Seasonal wetness, rapid permeability, restricted permeability
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.
• Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 4W
Michigan soil management group: 4/1b

70—Lupton muck

Setting

Landform: Depressions on lake plains, outwash plains, till plains, and moraines
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 20 acres

Typical Profile

Surface layer:
0 to 30 inches—black muck

Substratum:
30 to 80 inches—black and dark reddish brown muck

Soil Properties and Qualities

Permeability: Moderately slow to moderately rapid
Available water capacity: Very high
Drainage class: Very poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from October through May
Surface runoff: Very slow or ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Potential for frost action: High

Composition

Lupton soil and similar soils: 95 to 100 percent
Contrasting inclusions: 0 to 5 percent

Inclusions

Contrasting inclusions:
• The very poorly drained Deford soils, which have less than 8 inches of muck at the surface

Similar inclusions:
• Soils that have less decomposed organic layers in the lower part of the substratum
• Soils that have 16 to 51 inches of muck over sand or loam

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, plant competition, seedling mortality, windthrow hazard, seasonal wetness
Management considerations:
• Because of wetness and low strength, special harvesting equipment is needed. The equipment can be used only during periods in winter when skid roads and access roads are frozen.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings are beneficial for natural regeneration.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.

Building sites

Major management concerns: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Ponding

Management considerations:
• Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: 2W
Michigan soil management group: Mc

71—Tawas muck

Setting

Landform: Depressions on lake plains, outwash plains, and till plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 20 acres

Typical Profile

Surface layer:
0 to 12 inches—black muck

Subsoil:
12 to 24 inches—black, very friable muck

Substratum:
24 to 80 inches—light brownish gray sand

Soil Properties and Qualities

Permeability: Moderately slow to moderately rapid in the mucky part and rapid in the sandy part
Available water capacity: High
Drainage class: Very poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from October through May
Surface runoff: Very slow or ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: High

Composition

Tawas soil and similar soils: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
• The very poorly drained Deford soils, which have less than 8 inches of muck at the surface
• The somewhat poorly drained Au Gres soils

Similar inclusions:
• Soils that have thin loamy layers in the substratum
• Soils that have more than 51 inches of muck

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, plant competition, seedling mortality, windthrow hazard, seasonal wetness
Management considerations:
• Because of wetness and low strength, special harvesting equipment is needed. The equipment can be used only during periods in winter when skid roads and access roads are frozen.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings are beneficial for natural regeneration.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.

Building sites

Major management concerns: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: 5W
Michigan soil management group: M/4c

72—Dorval muck

Setting

Landform: In depressions and along drainageways on lake plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 150 acres

Typical Profile

Surface layer:
0 to 5 inches—very dark gray muck

Subsoil:
5 to 18 inches—black, friable muck

Substratum:
18 to 20 inches—dark grayish brown marl
20 to 80 inches—grayish brown, mottled silty clay

Soil Properties and Qualities

Permeability: Moderate or moderately rapid in the mucky part and very slow in the silty clay part
Available water capacity: High
Drainage class: Very poorly drained
Seasonal high water table: Perched 1 foot above to 1 foot below the surface at some time from November through May
Surface runoff: Very slow or ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: High
Potential for frost action: High

Composition

Dorval soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Algonquin soils

Similar inclusions:
- Soils that have a sandy or loamy substratum
- Soils that have more than 51 inches of muck

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, windthrow hazard, seedling mortality, plant competition, seasonal wetness
Management considerations:
- Because of wetness and low strength, special harvesting equipment is needed. The equipment can be used only during periods in winter when skid roads and access roads are frozen.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
- Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings are beneficial for natural regeneration.
- Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.

Building sites

Major management concerns: Ponding
Management considerations:
- Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Ponding
Management considerations:
- Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 2W
Michigan soil management group: M/1c

75B—Rubicon sand, 0 to 6 percent slopes

Setting

Landform: Outwash plains, stream terraces, till plains, and moraines
Shape of areas: Irregular
Size of areas: 10 to 200 acres

Typical Profile

Organic mat:
0 to 1 inch—undecomposed pine needles

Surface layer:
1 to 4 inches—black sand

Subsurface layer:
4 to 9 inches—gray sand

Subsoil:
9 to 24 inches—dark brown and strong brown, very friable sand
24 to 41 inches—light yellowish brown, loose sand

Substratum:
41 to 80 inches—very pale brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 6 feet

Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Rubicon soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The moderately well drained, sandy Croswell soils
- The moderately well drained, sandy over loamy Morganlake soils

Similar inclusions:
- Soils that have a lighter colored subsoil
- Soils that have a loamy substratum below a depth of 50 inches
- Soils that have thin bands of loamy sand in the substratum

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
- Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
- Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.

Building sites

Major management concerns: Cutbanks caving
Management considerations:
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.

Septic tank absorption fields

Major management concerns: Rapid permeability
Management considerations:
- The poor filtering capacity of this soil can result in the pollution of ground water.
- Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 4S
Michigan soil management group: 5.3a

75D—Rubicon sand, 6 to 18 percent slopes

Setting

Landform: Stream terraces and moraines
Shape of areas: Irregular or linear
Size of areas: 10 to 50 acres

Typical Profile

Organic mat:
0 to 1 inch—undecomposed pine needles

Surface layer:
1 to 4 inches—black sand

Subsurface layer:
4 to 9 inches—gray sand

Subsoil:
9 to 24 inches—dark brown and strong brown, very friable sand
24 to 41 inches—light yellowish brown, loose sand

Substratum:
41 to 80 inches—very pale brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow or medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Rubicon soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The moderately well drained Morganlake soils
- The well drained Menominee soils

Similar inclusions:
• Soils that have a lighter colored subsoil
• Soils that have bands of gravelly sand in the substratum
• Soils that have thin bands of loamy sand in the substratum

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• The grade should be kept as low as possible.
• Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
• Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.

Building sites

Major management concerns: Cutbanks caving, slope
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Because of the slope, this soil is poorly suited to building site development unless extensive land shaping is feasible.

Septic tank absorption fields

Major management concerns: Rapid permeability, slope
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 4S
Michigan soil management group: 5.3a

75E—Rubicon sand, 18 to 35 percent slopes

Setting

Landform: Stream terraces and moraines
Shape of areas: Linear
Size of areas: 5 to 25 acres

Typical Profile

Surface layer:
0 to 4 inches—black sand

Subsurface layer:
4 to 9 inches—gray sand

Subsoil:
9 to 24 inches—dark brown and strong brown, very friable sand
24 to 41 inches—light yellowish brown, loose sand

Substratum:
41 to 80 inches—very pale brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Rapid
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Rubicon soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The well drained Menominee soils
• The moderately well drained Croswell soils

Similar inclusions:
• Soils that have a lighter colored subsoil
• Soils that have bands of gravelly sand in the substratum
• Soils that have thin bands of loamy sand in the substratum

Use and Management

Land use: Woodland

Woodland

Major management concerns: Slope, erosion hazard, equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• The grade should be kept as low as possible.
• Because loose sand and the slope can hinder the traction of wheeled equipment, skid roads should be built on the contour or on the gentler slopes.
• The hazard of erosion can be reduced by seeding logging roads, landings, and areas that have been cut and filled and by installing water bars and culverts.
• Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
• Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.

Building sites

Major management concerns: Slope
Management considerations:
• Because of the slope, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Slope
Management considerations:
• Because of the slope, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 4R
Michigan soil management group: 5.3a

75F—Rubicon sand, 35 to 70 percent slopes

Setting

Landform: Stream terraces and moraines
Shape of areas: Linear
Size of areas: 5 to 25 acres

Typical Profile

Surface layer:
0 to 4 inches—black sand

Subsurface layer:
4 to 9 inches—gray sand

Subsoil:
9 to 16 inches—dark brown, very friable sand
16 to 24 inches—strong brown, very friable sand
24 to 41 inches—light yellowish brown, loose sand

Substratum:
41 to 80 inches—very pale brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Rapid
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Rubicon soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The well drained Menominee soils
• The moderately well drained Croswell soils

Similar inclusions:
• Soils that have a lighter colored subsoil
• Soils that have bands of gravelly sand in the substratum
• Soils that have thin bands of loamy sand in the substratum

Use and Management

Land use: Woodland

Woodland

Major management concerns: Slope, erosion hazard, equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
• Ordinary crawler tractors and rubber-tired skidders cannot be operated safely because of the slope. As a result, special logging methods, such as yarding the logs with a cable, may be needed.
• The hazard of erosion can be reduced by seeding logging roads, landings, and areas that have been cut and filled and by installing water bars and culverts.
• Because loose sand and the slope can hinder the

traction of wheeled equipment, skid roads should be built on the contour or on the gentler slopes.
• Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
• Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.

Building sites

Major management concerns: Slope
Management considerations:
• Because of the slope, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Slope
Management considerations:
• Because of the slope, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 4R
Michigan soil management group: 5.3a

77—Rollaway muck, frequently flooded

Setting

Landform: Flood plains
Slope range: 0 to 2 percent
Shape of areas: Linear
Size of area: 25 acres

Typical Profile

Surface layer:
0 to 9 inches—very dark gray muck

Subsurface layer:
9 to 13 inches—black, mottled silt loam

Substratum:
13 to 18 inches—dark gray, mottled silt loam
18 to 55 inches—dark grayish brown and black loamy sand and sandy loam
55 to 80 inches—brown silty clay

Soil Properties and Qualities

Permeability: Moderate in the loamy part and very slow in the silty clay part
Available water capacity: High
Drainage class: Very poorly drained
Seasonal high water table: Apparent, 2 feet above to 1 foot below the surface at some time from January through December
Surface runoff: Very slow or ponded
Flooding: Frequent
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: High

Composition

Rollaway soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Colonville soils

Similar inclusions:
• Soils that have a thinner surface layer of muck

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, windthrow hazard, seedling mortality, seasonal wetness, plant competition
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• Landing sites generally can be used only during the driest time of the year.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.

Building sites

Major management concerns: Seasonal flooding
Management considerations:
• Because of flooding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Seasonal flooding
Management considerations:
• Because of flooding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 3W
Michigan soil management group: L-2c

78—Pits, borrow

Setting

Shape of areas: Irregular or oval
Size of areas: 5 to 10 acres

Composition

Pits: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• Areas of Udorthents or Udipsamments in which regrowth of some vegetation has occurred
• The excessively drained Grayling soils along the edges of the active pit area

Use and Management

Land use: Source of gravel, sand, or fill material; some areas have been excavated below the seasonal high water table and are ponded.
Management considerations:
• Onsite investigation is needed to determine the suitability for specific uses.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned

81B—Grayling sand, 0 to 6 percent slopes

Setting

Landform: Outwash plains and deltas
Shape of areas: Irregular
Size of areas: 10 to 1,000 acres

Typical Profile

Surface layer:
0 to 3 inches—black sand

Subsoil:
3 to 14 inches—dark brown, very friable sand
14 to 41 inches—yellowish brown and light yellowish brown, loose sand

Substratum:
41 to 80 inches—very pale brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Grayling soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The excessively drained Rubicon soils, which have a darker subsoil than the Grayling soil
• The moderately well drained Croswell soils

Similar inclusions:
• Soils that have bands of loamy sand in the substratum

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.

Building sites

Major management concerns: Cutbanks caving
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.

Septic tank absorption fields

Major management concerns: Rapid permeability
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 4S
Michigan soil management group: 5.7a

81D—Grayling sand, 6 to 18 percent slopes

Setting

Landform: Knolls and low ridges on outwash plains and deltas
Shape of areas: Irregular or linear
Size of areas: 5 to 100 acres

Typical Profile

Surface layer:
0 to 3 inches—black sand

Subsoil:
3 to 14 inches—dark brown, very friable sand
14 to 41 inches—yellowish brown and light yellowish brown, loose sand

Substratum:
41 to 80 inches—very pale brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Grayling soil and similar soils: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
• The excessively drained Rubicon soils, which have a darker subsoil than the Grayling soil
• The moderately well drained Croswell soils

Similar inclusions:
• Soils that have bands of loamy sand in the substratum

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
• Because loose sand and the slope can hinder the traction of wheeled equipment, skid roads should be built on the contour or on the gentler slopes.
• Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.

Building sites

Major management concerns: Cutbanks caving, slope
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Because of the slope, this soil is poorly suited to building site development unless extensive land shaping is feasible.

Septic tank absorption fields

Major management concerns: Rapid permeability, slope
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 4S
Michigan soil management group: 5.7a

81E—Grayling sand, 18 to 35 percent slopes

Setting

Landform: Escarpments and breaks to drainageways on deltas and outwash plains
Shape of areas: Linear
Size of areas: 5 to 50 acres

Typical Profile

Surface layer:
0 to 3 inches—black sand

Subsoil:
3 to 14 inches—dark brown, very friable sand
14 to 41 inches—yellowish brown and light yellowish brown, loose sand

Substratum:
41 to 80 inches—very pale brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Rapid
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Grayling soil and similar soils: 95 to 100 percent
Contrasting inclusions: 0 to 5 percent

Inclusions

Contrasting inclusions:
• The excessively drained Rubicon soils, which have a darker subsoil than the Grayling soil
• The well drained Menominee soils

Similar inclusions:
• Soils that have bands of loamy sand in the substratum

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, slope, erosion hazard, seedling mortality, seasonal droughtiness
Management considerations:
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• The grade should be kept as low as possible.
• Because loose sand and the slope can hinder the traction of wheeled equipment, skid roads should be built on the contour or on the gentler slopes.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures. Building logging roads on the contour or on the gentler slopes and seeding logging roads, skid roads, and landings after the trees are logged also help to prevent excessive soil loss.
• Planting special nursery stock or containerized seedlings can reduce the seedling mortality rate. Planting when the soil is moist can also reduce the seedling mortality rate.

Building sites

Major management concerns: Slope
Management considerations:
• Because of the slope, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Slope
Management considerations:
• Because of the slope, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 4R
Michigan soil management group: 5.7a

82C—Udorthents, loamy, nearly level to gently rolling

Setting

Landform: Ridges and knolls on lake plains and moraines
Slope range: 0 to 12 percent
Shape of areas: Irregular
Size of areas: 5 to 25 acres

Typical Profile

Surface layer:
0 to 12 inches—very dark grayish brown silty clay loam

Substratum:
12 to 80 inches—dark brown and strong brown silty clay loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow or medium
Flooding: None
Hazard of water erosion: Slight or moderate
Hazard of soil blowing: Slight
Shrink-swell potential: Moderate
Potential for frost action: Not evaluated

Composition

Udorthents and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
- Active borrow areas

Similar inclusions:
- Soils that have more clay in the substratum

Use and Management

Land use: Idle land
Management considerations:
- Onsite investigation is needed to determine the suitability for specific uses.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned

82F—Udorthents, loamy, very steep

Setting

Landform: Overburden areas around gypsum quarries
Slope range: 35 to 50 percent
Shape of areas: Irregular
Size of areas: 25 to 500 acres

Typical Profile

Surface layer:
0 to 24 inches—dark brown silty clay loam

Substratum:
24 to 40 inches—dark brown silty clay loam
40 to 80 inches—brown silty clay loam

Soil Properties and Qualities

Permeability: Moderately slow
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Very rapid
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Moderate
Shrink-swell potential: Moderate
Potential for frost action: Not evaluated

Composition

Udorthents and similar soils: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Algonquin and Allendale soils

Similar inclusions:
- Soils that have more clay in the substratum

Use and Management

Land use: Idle land
Management considerations:
- Onsite investigation is needed to determine the suitability for specific uses.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned

83B—Udipsamments, nearly level and undulating

Setting

Landform: Flats and low knolls on outwash plains, lake plains, stream terraces, and moraines
Slope range: 0 to 6 percent

Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Surface layer:
0 to 5 inches—very dark grayish brown loamy sand

Subsoil:
5 to 32 inches—yellowish brown, loose sand

Substratum:
32 to 80 inches—pale brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Very low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Udipsamments and similar soils: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
- Small undisturbed areas of Grayling sand
- Soils that have a surface layer of sandy loam

Similar inclusions:
- Soils that have thin bands of sandy loam or gravelly sand below the surface layer

Use and Management

Land use: Idle land
Management considerations:
- Onsite investigation is needed to determine the suitability for specific uses.
- This map unit consists of sandy areas where the surface layer and part of the subsoil have been removed or disturbed. In some areas the original soil has been covered with sandy fill material. Most areas are barren or only sparsely vegetated.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned

84B—Zimmerman loamy fine sand, 0 to 6 percent slopes

Setting

Landform: Deltas
Shape of areas: Irregular
Size of area: 20 acres

Typical Profile

Surface layer:
0 to 2 inches—black loamy fine sand

Subsurface layer:
2 to 4 inches—grayish brown loamy fine sand

Subsoil:
4 to 7 inches—strong brown, very friable loamy fine sand
7 to 24 inches—yellowish brown, very friable loamy fine sand
24 to 80 inches—yellowish brown, very friable fine sand with thin bands of strong brown loamy fine sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Zimmerman soil and similar soils: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
- The moderately well drained Croswell soils

Similar inclusions:
- Soils that are medium sand

Use and Management

Land use: Woodland

Woodland

Major management concerns: Seedling mortality, seasonal droughtiness, equipment limitations

Management considerations:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.

Building sites

Major management concerns: Cutbanks caving
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.

Septic tank absorption fields

Major management concerns: Rapid permeability
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 8S
Michigan soil management group: 4a

86—Histosols and Aquents, ponded

Setting

Landform: Depressions on lake plains, outwash plains, till plains, moraines, and flood plains
Slope range: 0 to 2 percent
Shape of areas: Oval, linear, or irregular
Size of areas: 3 to 100 acres

Typical Profile

Histosols

Surface layer:
0 to 10 inches—black muck

Subsoil:
10 to 51 inches—very dark gray, friable muck

Substratum:
51 to 80 inches—gray sandy loam

Aquents

Surface layer:
0 to 3 inches—black muck

Subsoil:
3 to 20 inches—gray, loose sand

Substratum:
20 to 80 inches—light brownish gray sand

Soil Properties and Qualities

Permeability: Moderately rapid to moderately slow
Available water capacity: Histosols—high; Aquents—low
Drainage class: Very poorly drained
Seasonal high water table: Apparent, at the surface to 1 foot above the surface at some time from January through December
Surface runoff: Ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Histosols—moderate; Aquents—not evaluated
Shrink-swell potential: Not evaluated
Potential for frost action: High

Composition

Aquents: 0 to 100 percent
Histosols: 0 to 100 percent
Contrasting inclusions: 0 to 5 percent

Contrasting Inclusions

• Soils that are poorly drained or somewhat poorly drained

Use and Management

Land use: Wetland wildlife habitat
Management considerations:
• Onsite investigation is needed to determine the suitability for specific uses.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned

93B—Tacoda-Wakeley complex, 0 to 4 percent slopes

Setting

Landform: Lake plains
Slope range: Tacoda—0 to 4 percent; Wakeley—0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 50 acres

Typical Profile

Tacoda

Surface layer:
0 to 3 inches—black sand

Subsurface layer
3 to 15 inches—light gray, mottled sand

Subsoil:
15 to 23 inches—dark brown, mottled, friable sand
23 to 35 inches—very pale brown and light yellowish brown, mottled, loose sand
35 to 45 inches—brown, mottled, loose sand

Substratum:
45 to 60 inches—dark brown silty clay
60 to 80 inches—brown, mottled silty clay

Wakeley

Surface layer:
0 to 5 inches—black muck

Substratum:
5 to 16 inches—dark grayish brown and grayish brown, mottled sand
16 to 27 inches—brown, mottled sand
27 to 80 inches—reddish brown and pinkish gray, mottled clay

Soil Properties and Qualities

Permeability: Rapid in the sandy part and very slow in the clayey part
Available water capacity: Tacoda—low; Wakeley—moderate
Drainage class: Tacoda—somewhat poorly drained; Wakeley—very poorly drained
Seasonal high water table: Tacoda—perched at a depth of 0.5 foot to 1.5 feet at some time from October through May; Wakeley—perched 1 foot above to 1 foot below the surface at some time from October through May
Surface runoff: Tacoda—very slow; Wakeley—very slow or ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Tacoda—severe; Wakeley—moderate
Shrink-swell potential: Tacoda—low; Wakeley—high
Potential for frost action: Moderate

Composition

Tacoda soil and similar soils: 50 to 60 percent
Wakeley soil and similar soils: 40 to 50 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
- The very poorly drained, sandy Leafriver soils

Similar inclusions:
- Soils that have thinner sandy layers

Use and Management

Dominant land use: Woodland
Other use: Pasture

Pasture

Major management concerns: Tacoda—seasonal wetness, seasonal droughtiness; Wakeley—seasonal wetness
Management considerations:
- Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
- Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
- Hay and pasture plants that can withstand periodic inundation and seasonal wetness should be seeded.
- Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, windthrow hazard, plant competition, seedling mortality, seasonal wetness
Management considerations:
- Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
- The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
- Carefully managed reforestation helps to control undesirable understory plants.
- Special harvest methods may be needed to control undesirable plants.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
- Because of wetness, seedling mortality, and plant competition, trees are generally not planted on the Wakeley soil.

Building sites

Major management concerns: Tacoda—cutbanks

caving, seasonal wetness, shrink-swell; Wakeley—ponding

Management considerations:

• Because cutbanks in areas of the Tacoda soil are not stable and are subject to caving, trench walls should be reinforced.

• In areas of the Tacoda soil, buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.

• In areas of the Tacoda soil, properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.

• Because of ponding, the Wakeley soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Tacoda—rapid permeability, restricted permeability, seasonal wetness; Wakeley—ponding

Management considerations:

• The poor filtering capacity of the Tacoda soil can result in the pollution of ground water.

• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.

• Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability in areas of the Tacoda soil.

• In areas of the Tacoda soil, filling or mounding with suitable material helps to raise the absorption field above the water table.

• Because of ponding, the Wakeley soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: IVw

Woodland ordination symbol: Tacoda—4W; Wakeley—3W

Michigan soil management group: Tacoda—5b; Wakeley—4/1c

97—Colonville very fine sandy loam, occasionally flooded

Setting

Landform: Flood plains

Slope range: 0 to 2 percent

Shape of areas: Linear

Size of areas: 10 to 100 acres

Typical Profile

Surface layer:

0 to 6 inches—very dark gray very fine sandy loam

6 to 11 inches—very dark grayish brown, mottled very fine sandy loam

Subsoil:

11 to 16 inches—brown, mottled very fine sandy loam

Substratum:

16 to 80 inches—pale brown, mottled, stratified fine sand, silt loam, and very fine sandy loam

Soil Properties and Qualities

Permeability: Moderate

Available water capacity: High

Drainage class: Somewhat poorly drained

Seasonal high water table: Apparent, at a depth of 0.5 foot to 1.5 feet at some time from October through May

Surface runoff: Very slow

Flooding: Occasional

Hazard of water erosion: Slight

Hazard of soil blowing: Moderate

Shrink-swell potential: Low

Potential for frost action: High

Composition

Colonville soil and similar soils: 85 to 90 percent

Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:

• The very poorly drained, sandy Rollaway soils

• The very poorly drained, mucky over sandy Tawas soils

Similar inclusions:

• Soils that have a surface layer of mucky very fine sandy loam

• Soils that have a thinner surface layer

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, windthrow hazard, plant competition, seasonal wetness

Management considerations:

• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.

• Skidders should not be used during wet periods, when ruts form easily.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Trees that can withstand seasonal wetness should be selected for planting.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.

Building sites

Major management concerns: Seasonal flooding
Management considerations:
• Because of flooding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Seasonal flooding
Management considerations:
• Because of flooding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 3W
Michigan soil management group: L-2c

100D—Curtisville sandy loam, 12 to 18 percent slopes

Setting

Landform: Moraines and till plains
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Surface layer:
0 to 5 inches—very dark grayish brown sandy loam

Subsoil:
5 to 10 inches—light brownish gray, friable sandy loam and dark yellowish brown, friable sandy loam
10 to 16 inches—brown, firm clay loam and brown, firm sandy loam
16 to 29 inches—reddish brown, firm clay

Substratum:
29 to 80 inches—reddish brown and brown clay loam

Soil Properties and Qualities

Permeability: Slow
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Rapid
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Moderate
Shrink-swell potential: Moderate
Potential for frost action: Moderate

Composition

Curtisville soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The well drained, sandy over loamy Menominee soils
• The somewhat poorly drained Kawkawlin soils
• The poorly drained Sims soils

Similar inclusions:
• Soils that have more clay in the subsoil
• Soils that have a surface layer of clay loam
• Soils that have a sandy substratum

Use and Management

Dominant land use: Pasture
Other uses: Cropland, woodland

Cropland

Major management concerns: Water erosion, soil blowing, soil compaction, tilth in the surface layer, restricted permeability, nutrient and pesticide loss
Management considerations:
• Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to prevent excessive soil loss.
• A system of conservation tillage that leaves crop residue on the surface helps to control water erosion, helps to prevent crusting during periods of heavy rainfall, and increases the rate of water infiltration.
• Conservation tillage, crop residue management, windbreaks, and cover crops help to control soil blowing.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.
• Conservation tillage systems, contour farming, cover

crops, and sod-based rotations can minimize the detachment and loss of nutrients associated with sediment and thus help to prevent the loss of solid-phase nitrogen and phosphorus.

Pasture

Major management concerns: Soil compaction
Management considerations:
• Proper stocking rates, uniform distribution of grazing, and a planned grazing system help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests can help to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Plant competition, equipment limitations, slope
Management considerations:
• The grade should be kept as low as possible.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Special harvest methods may be needed to control undesirable plants.
• If trees are planted, site preparation is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.

Building sites

Major management concerns: Slope, shrink-swell
Management considerations:
• Because of the slope, this soil is poorly suited to building site development unless extensive land shaping is feasible.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Major management concerns: Restricted permeability, slope
Management considerations:
• Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 3L
Michigan soil management group: 1.5a

100E—Curtisville sandy loam, 18 to 25 percent slopes

Setting

Landform: Moraines and till plains
Shape of areas: Linear
Size of areas: 5 to 50 acres

Typical Profile

Surface layer:
0 to 5 inches—very dark grayish brown sandy loam

Subsoil:
5 to 10 inches—light brownish gray, friable sandy loam and dark yellowish brown, friable sandy loam
10 to 16 inches—brown, firm clay loam and brown, firm sandy loam
16 to 29 inches—reddish brown, firm clay

Substratum:
29 to 80 inches—reddish brown and brown clay loam

Soil Properties and Qualities

Permeability: Slow
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Rapid
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Moderate
Shrink-swell potential: Moderate
Potential for frost action: Moderate

Composition

Curtisville soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The well drained, sandy over loamy Menominee soils
• The somewhat poorly drained Kawkawlin soils

Similar inclusions:
• Soils that have more clay in the subsoil
• Soils that have a surface layer of clay loam
• Soils that have a sandy substratum

Use and Management

Dominant land use: Woodland

Other use: Pasture

Pasture

Major management concerns: Compaction
Management considerations:
• Proper stocking rates, uniform distribution of grazing, and a planned grazing system help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests can help to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Erosion hazard, equipment limitations, plant competition, slope
Management considerations:
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• The grade should be kept as low as possible.
• The hazard of erosion can be reduced by seeding logging roads, landings, and areas that have been cut and filled and by installing water bars and culverts.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Special harvest methods may be needed to control undesirable plants.
• If trees are planted, site preparation is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.

Building sites

Major management concerns: Slope
Management considerations:
• Because of the slope, this soil is poorly suited to building site development unless extensive land shaping is feasible.

Septic tank absorption fields

Major management concerns: Slope
Management considerations:
• Because of the slope, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIe
Woodland ordination symbol: 3R
Michigan soil management group: 1.5a

103B—Nester sandy loam, 1 to 6 percent slopes

Setting

Landform: Moraines and till plains
Shape of areas: Irregular
Size of areas: 5 to 500 acres

Typical Profile

Surface layer:
0 to 11 inches—very dark grayish brown sandy loam

Subsoil:
11 to 17 inches—light grayish brown, friable sandy loam and dark brown, friable clay loam
17 to 34 inches—brown, firm clay loam

Substratum:
34 to 50 inches—strong brown, mottled clay loam
50 to 80 inches—brown clay loam

Soil Properties and Qualities

Permeability: Slow
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 2.5 to 3.5 feet at some time from November through May
Surface runoff: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Moderate
Potential for frost action: Moderate

Composition

Nester soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Kawkawlin soils
• The moderately well drained, sandy over loamy Morganlake soils
• The poorly drained Sims soils

Similar inclusions:
• Soils that have more clay in the subsoil
• Soils that have less clay in the subsoil
• Soils that have a surface layer of loamy sand
• Soils that have sandy layers below a depth of 60 inches

Use and Management

Dominant land use: Cropland
Other uses: Woodland, pasture

Cropland

Major management concerns: Water erosion, soil blowing, soil compaction, tilth in the surface layer, restricted permeability, seasonal wetness
Management considerations:
• A system of conservation tillage that leaves crop residue on the surface helps to control water erosion, helps to prevent crusting during periods of heavy rainfall, and increases the rate of water infiltration.
• Conservation tillage, crop residue management, windbreaks, and cover crops help to control soil blowing.
• Because of the restricted permeability, subsurface drains should be narrowly spaced.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.

Pasture

Major management concerns: Soil compaction, seasonal wetness
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Restricted grazing during wet periods helps to prevent compaction and poor tilth.

Woodland

Major management concerns: Plant competition, equipment limitations, seasonal wetness
Management considerations:
• Skidders should not be used during wet periods, when ruts form easily.
• Special harvest methods may be needed to control undesirable plants.
• If trees are planted, site preparation by mechanical or chemical means is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.

Building sites

Major management concerns: Shrink-swell
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Major management concerns: Restricted permeability, seasonal wetness
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 3L
Michigan soil management group: 1.5a

103C—Nester sandy loam, 6 to 12 percent slopes

Setting

Landform: Moraines and till plains
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Typical Profile

Surface layer:
0 to 11 inches—very dark grayish brown sandy loam

Subsoil:
11 to 17 inches—light grayish brown, friable sandy loam and dark brown, friable clay loam
17 to 34 inches—brown, firm clay loam

Substratum:
34 to 50 inches—strong brown, mottled clay loam
50 to 80 inches—brown clay loam

Soil Properties and Qualities

Permeability: Slow
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 2.5 to 3.5 feet at some time from November through May
Surface runoff: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Moderate
Potential for frost action: Moderate

Composition

Nester soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained, sandy over loamy Morganlake soils
• The poorly drained Sims soils

Similar inclusions:
• Soils that have more clay in the subsoil
• Soils that have a surface layer of clay loam
• Soils that have sandy layers below a depth of 60 inches

Use and Management

Dominant land use: Cropland
Other uses: Woodland, pasture

Cropland

Major management concerns: Water erosion, soil blowing, soil compaction, tilth in the surface layer, restricted permeability, seasonal wetness
Management considerations:
• A system of conservation tillage that leaves crop residue on the surface helps to control water erosion, helps to prevent crusting during periods of heavy rainfall, and increases the rate of water infiltration.
• Conservation tillage, crop residue management, windbreaks, and cover crops help to control soil blowing.
• Because of the restricted permeability, subsurface drains should be narrowly spaced.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.

Pasture

Major management concerns: Soil compaction, seasonal wetness
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Restricted grazing during wet periods helps to prevent compaction and poor tilth.

Woodland

Major management concerns: Plant competition, equipment limitations, seasonal wetness
Management considerations:
• Skidders should not be used during wet periods, when ruts form easily.
• Special harvest methods may be needed to control undesirable plants.
• If trees are planted, site preparation by mechanical or chemical means is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.

Building sites

Major management concerns: Slope, shrink-swell
Management considerations:
• Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Major management concerns: Restricted permeability, seasonal wetness, slope
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 3L
Michigan soil management group: 1.5a

108B—Selkirk loam, 0 to 4 percent slopes

Setting

Landform: Till plains and moraines
Shape of areas: Irregular
Size of areas: 3 to 200 acres

Typical Profile

Surface layer:
0 to 9 inches—dark brown loam

Subsoil:
9 to 15 inches—yellowish brown, mottled, friable loam and pale brown, mottled, friable sandy loam
15 to 28 inches—dark brown and brown, mottled, firm clay

Substratum:
28 to 80 inches—light yellowish brown and brown, mottled clay

Soil Properties and Qualities

Permeability: Slow
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched at a depth of 0.5 foot to 1.5 feet at some time from October through May
Surface runoff: Slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: High
Potential for frost action: High

Composition

Selkirk soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The poorly drained Sims soils
- The moderately well drained Kent soils
- The somewhat poorly drained, sandy over clayey Allendale soils; in landscape positions similar to those of the Selkirk soil

Similar inclusions:
- Soils that have a sandy substratum
- Soils that have less clay in the subsoil
- Soils that have a surface layer of clay loam

Use and Management

Dominant land use: Cropland
Other uses: Pasture, woodland

Cropland

Major management concerns: Seasonal wetness, tilth in the surface layer, soil compaction, restricted permeability
Management considerations:
- Most adapted crops can be grown if an adequate drainage system is installed.
- Because of the restricted permeability, subsurface drains should be narrowly spaced.
- Crop rotations that include grasses and legumes and small grain help to control runoff and water erosion.
- Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.
- Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.

Pasture

Major management concerns: Seasonal wetness, compaction
Management considerations:
- Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
- Restricted grazing during wet periods helps to prevent compaction and poor tilth.

Woodland

Major management concerns: Equipment limitations, plant competition, seedling mortality, windthrow hazard, seasonal wetness
Management considerations:
- The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, and midwinter, when the soil is frozen or has adequate snow cover.
- Skidders should not be used during wet periods, when ruts form easily.
- Special harvest methods may be needed to control undesirable plants.
- If trees are planted, site preparation is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.
- Trees that can withstand seasonal wetness should be selected for planting.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Building sites

Major management concerns: Seasonal wetness, shrink-swell
Management considerations:
- Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
- Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.
- Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Major management concerns: Seasonal wetness, restricted permeability
Management considerations:
- Filling or mounding with suitable material helps to raise the absorption field above the water table.

• A subsurface drainage system helps to lower the water table.
• Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 4C
Michigan soil management group: 1b

114A—Ingalls sand, 0 to 3 percent slopes

Setting

Landform: Lake plains and outwash plains
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Surface layer:
0 to 9 inches—black sand

Subsurface layer:
9 to 12 inches—light gray sand

Subsoil:
12 to 16 inches—dark brown, mottled, very friable sand
16 to 27 inches—pale brown, mottled, friable fine sand

Substratum:
27 to 42 inches—pale brown, light gray, and light reddish brown, stratified sand, very fine sand, and silt
42 to 80 inches—brown, strong brown, and pale brown, stratified fine sand, fine sandy loam, silty clay loam, and silt

Soil Properties and Qualities

Permeability: Rapid in the sandy part and moderately slow in the stratified part
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched at a depth of 0.5 foot to 1.5 feet at some time from October through May
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

Ingalls soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The very poorly drained Wakeley soils

Similar inclusions:
• Soils that have a lighter colored subsoil

Use and Management

Dominant land use: Cropland
Other uses: Pasture, woodland

Cropland

Major management concerns: Soil blowing, seasonal wetness
Management considerations:
• Conservation tillage, crop residue management, windbreaks, and cover crops help to control soil blowing.
• Most adapted crops can be grown if an adequate drainage system is installed.
• Subsurface drains can reduce the wetness if a suitable outlet is available.

Pasture

Major management concerns: Seasonal wetness, overgrazing
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Hay and pasture plants that can withstand periodic inundation and seasonal wetness should be seeded.

Woodland

Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition, seasonal wetness
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• Trees that can withstand seasonal wetness should be selected for planting.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced

and by such harvest methods as selective cutting and strip cutting.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.

Building sites

Major management concerns: Cutbanks caving, seasonal wetness
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Rapid permeability, restricted permeability, seasonal wetness
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 4W
Michigan soil management group: 4/2b-s

120B—Morganlake sand, 0 to 6 percent slopes

Setting

Landform: Moraines and till plains
Shape of areas: Irregular
Size of areas: 3 to 200 acres

Typical Profile

Surface layer:
0 to 4 inches—black sand

Subsurface layer:
4 to 6 inches—light brownish gray sand

Subsoil:
6 to 13 inches—dark brown, friable sand
13 to 23 inches—brown, very friable sand
23 to 29 inches—light brownish gray, mottled, very friable loamy sand
29 to 47 inches—dark brown, mottled firm clay loam and pinkish gray, very friable sandy loam

Substratum:
47 to 80 inches—reddish brown, mottled clay loam

Soil Properties and Qualities

Permeability: Rapid in the sandy part and moderately slow in the loamy part
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 2.0 to 3.5 feet at some time from October through May
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Moderate
Potential for frost action: Low

Composition

Morganlake soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained, loamy Nester soils
• The somewhat poorly drained Kokosing soils

Similar inclusions:
• Soils that have a lighter colored subsoil
• Soils that have a loamy substratum at a depth of more than 40 inches

Use and Management

Dominant land use: Cropland
Other uses: Pasture, woodland

Cropland

Major management concerns: Soil blowing, seasonal droughtiness

Management considerations:
• Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing. Maintaining a permanent plant cover also helps to control soil blowing.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.
• A system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture and in reducing the hazard of soil blowing.

Pasture

Major management concerns: Overgrazing, seasonal droughtiness
Management considerations:
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
• Applying lime and fertilizer according to the results of soil tests can help to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Equipment limitations, seedling mortality, plant competition, seasonal droughtiness
Management considerations:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
• Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.

Building sites

Major management concerns: Cutbanks caving, seasonal wetness, shrink-swell
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Major management concerns: Rapid permeability, restricted permeability, seasonal wetness
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: 6S
Michigan soil management group: 4/2a

120C—Morganlake sand, 6 to 12 percent slopes

Setting

Landform: Moraines and till plains
Shape of areas: Irregular
Size of areas: 3 to 200 acres

Typical Profile

Surface layer:
0 to 4 inches—black sand

Subsurface layer:
4 to 6 inches—light brownish gray sand

Subsoil:
6 to 13 inches—dark brown, friable sand
13 to 23 inches—brown, very friable sand
23 to 29 inches—light brownish gray, mottled, very friable loamy sand
29 to 47 inches—dark brown, mottled, firm clay loam and pinkish gray, very friable sandy loam

Substratum:
47 to 80 inches—reddish brown, mottled clay loam

Soil Properties and Qualities

Permeability: Rapid in the sandy part and moderately slow in the loamy part
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 2.0 to 3.5 feet at some time from October through May
Surface runoff: Slow
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Moderate
Potential for frost action: Low

Composition

Morganlake soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The moderately well drained, loamy Nester soils
- The somewhat poorly drained Kokosing soils

Similar inclusions:
- Well drained soils in the steeper areas
- Soils that have a clayey substratum
- Soils that have a lighter colored subsoil
- Soils that have a loamy substratum at a depth of more than 40 inches

Use and Management

Dominant land use: Cropland
Other uses: Pasture, woodland

Cropland

Major management concerns: Soil blowing, water erosion, seasonal droughtiness
Management considerations:
- Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing. Maintaining a permanent plant cover also helps to control soil blowing.
- Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.
- Crop rotations that include grasses or legumes, conservation tillage, grassed waterways, and cover crops help to control water erosion.
- Growing grasses and legumes for pasture or hay is effective in controlling erosion.

Pasture

Major management concerns: Overgrazing, seasonal droughtiness
Management considerations:
- Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
- Applying lime and fertilizer according to the results of soil tests can help to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Equipment limitations, seedling mortality, plant competition, seasonal droughtiness
Management considerations:
- Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- Planting when the soil is moist and planting special nursery stock or containerized seedlings can reduce the seedling mortality rate. Planting seedlings that can withstand droughty conditions can also reduce the seedling mortality rate. Replanting is needed in some areas.
- Carefully managed reforestation helps to control undesirable understory plants.
- Special harvest methods may be needed to control undesirable plants.

Building sites

Major management concerns: Cutbanks caving, slope, seasonal wetness, shrink-swell
Management considerations:
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
- Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.
- Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
- Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.
- Filling or mounding with suitable material helps to raise the building site above the water table.

Septic tank absorption fields

Major management concerns: Rapid permeability, restricted permeability, slope, seasonal wetness
Management considerations:
- The poor filtering capacity of this soil can result in the pollution of ground water.

• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: 6S
Michigan soil management group: 4/2a

123D—Klacking sand, 6 to 18 percent slopes

Setting

Landform: Moraines and outwash plains
Shape of areas: Irregular
Size of areas: 20 acres

Typical Profile

Surface layer:
0 to 2 inches—black sand

Subsoil:
2 to 34 inches—yellowish brown and dark yellowish brown, friable sand
34 to 44 inches—yellowish brown, friable sand and strong brown, friable loamy sand
44 to 80 inches—strong brown, friable sandy loam and light yellowish brown, friable sand

Soil Properties and Qualities

Permeability: Moderately rapid
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Klacking soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The excessively drained Rubicon soils

Similar inclusions:
• Soils that have less than 6 inches of banding in the subsoil

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, seedling mortality, slope, seasonal droughtiness
Management considerations:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• The grade should be kept as low as possible.
• Planting when the soil is moist can reduce the seedling mortality rate. Planting seedlings that can withstand droughty conditions can also reduce the seedling mortality rate. Replanting is needed in some areas.

Building sites

Major management concerns: Slope, cutbanks caving
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Because of the slope, this soil is poorly suited to building site development unless extensive land shaping is feasible.

Septic tank absorption fields

Major management concerns: Slope
Management considerations:
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 6S
Michigan soil management group: 4a

124—Evart sand

Setting

Landform: Flood plains
Slope range: 0 to 2 percent
Shape of areas: Linear
Size of areas: 5 to 10 acres

Typical Profile

Surface layer:
0 to 10 inches—black sand
10 to 14 inches—very dark gray, mottled sand

Substratum:
14 to 22 inches—grayish brown sand
22 to 25 inches—dark grayish brown gravelly sand
25 to 36 inches—brown, mottled sand
36 to 80 inches—grayish brown, mottled sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from January through December
Surface runoff: Very slow or ponded
Flooding: Common
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

Evart soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The very poorly drained Tawas soils

Similar inclusions:
- Soils that are somewhat poorly drained

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition, seasonal wetness
Management considerations:
- The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
- Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.
- Carefully managed reforestation helps to control undesirable understory plants.
- Special harvest methods may be needed to control undesirable plants.

Building sites

Major management concerns: Seasonal flooding
Management considerations:
- Because of flooding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Seasonal flooding
Management considerations:
- Because of flooding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIw
Woodland ordination symbol: 2w
Michigan soil management group: L-4c

127—Cathro muck

Setting

Landform: Depressions on moraines, lake plains, and outwash plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 25 acres

Typical Profile

Surface layer:
0 to 5 inches—black muck

Substratum:
5 to 30 inches—black muck
30 to 80 inches—dark gray sandy loam

Soil Properties and Qualities

Permeability: Moderately slow to moderately rapid in the organic part and moderately slow or moderate in the loamy part
Available water capacity: High
Drainage class: Very poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from October through May
Surface runoff: Very slow or ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low

Potential for frost action: High

Composition

Cathro soil and similar soils: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
• The very poorly drained Deford soils, which have less than 8 inches of muck at the surface and are sandy

Similar inclusions:
• Soils that have a sandy substratum

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, seedling mortality, plant competition, windthrow, seasonal wetness
Management considerations:
• Because of wetness and low strength, special harvesting equipment is needed. The equipment can be used only during periods in winter when skid roads and access roads are frozen.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings are beneficial for natural regeneration.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Building sites

Major management concerns: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: 5W
Michigan soil management group: M/3c

128—Dawson peat

Setting

Landform: Depressions on lake plains, moraines, and outwash plains
Slope range: 0 to 2 percent
Shape of areas: Oval
Size of areas: 3 to 100 acres

Typical Profile

Surface layer:
0 to 3 inches—dark brown peat

Subsoil:
3 to 18 inches—black, friable muck
18 to 27 inches—very dark gray, friable muck

Substratum:
27 to 45 inches—dark brown sand
45 to 80 inches—dark yellowish brown sand

Soil Properties and Qualities

Permeability: Moderately slow to moderately rapid in the organic part and rapid in the sandy part
Available water capacity: High
Drainage class: Very poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from September through June
Surface runoff: Ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Low
Potential for frost action: High

Composition

Dawson soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The very poorly drained Deford soils, which have less than 8 inches of muck at the surface

Similar inclusions:
• Soils that are less acid throughout the profile
• Soils that have more than 51 inches of muck

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations,

plant competition, seasonal wetness, seedling mortality, windthrow hazard

Management considerations:

• Because of wetness and low strength, special harvesting equipment is needed. The equipment can be used only during periods in winter when skid roads and access roads are frozen.

• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.

• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Building sites

Major management concerns: Ponding

Management considerations:

• Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Ponding

Management considerations:

• Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIw
Woodland ordination symbol: 2W
Michigan soil management group: M/4c-a

130—Grousehaven muck

Setting

Landform: Lake plains, outwash plains, and moraines
Slope range: 0 to 1 percent
Shape of areas: Irregular
Size of areas: 10 to 80 acres

Typical Profile

Surface layer:
0 to 12 inches—black muck

Substratum:
12 to 80 inches—pinkish white, white, and gray marl

Soil Properties and Qualities

Permeability: Moderately slow to moderately rapid in the organic part and very slow in the marl
Available water capacity: Very high
Drainage class: Very poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from October through May
Surface runoff: Very slow or ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: High

Composition

Grousehaven soil and similar soils: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:

• The very poorly drained Deford soils, which have less than 8 inches of muck at the surface and are sandy

• Small areas of tufa

Similar inclusions:

• Soils that do not have a surface layer of muck

• Soils in which the marl in the substratum is stratified with sand or gravelly sand

• Soils that have more than 16 inches of muck

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition

Management considerations:

• Because of wetness and low strength, special harvesting equipment is needed. The equipment can be used only during periods in winter when skid roads and access roads are frozen.

• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.

• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Building sites

Major management concerns: Ponding

Management considerations:

• Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIw
Woodland ordination symbol: None assigned
Michigan soil management group: M/mc

159A—Finch sand, 0 to 3 percent slopes

Setting

Landform: Lake plains and outwash plains
Shape of areas: Irregular or linear
Size of areas: 5 to 100 acres

Typical Profile

Surface layer:
0 to 3 inches—black, well decomposed leaf litter

Subsurface layer:
3 to 12 inches—gray and light brownish gray, mottled sand

Subsoil:
12 to 21 inches—dark reddish brown and black, strongly cemented, very firm sand
21 to 28 inches—yellowish brown, mottled, loose sand

Substratum:
28 to 36 inches—yellowish brown, mottled sand
36 to 80 inches—brown sand

Soil Properties and Qualities

Permeability: Moderately rapid
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, at a depth of 0.5 foot to 1.5 feet at some time from October through May
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

Finch soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Proper soils
• The very poorly drained Deford and Leafriver soils

Similar inclusions:
• Soils that have a lighter colored subsoil
• Soils that do not have a cemented subsoil
• Soils that have clay material below a depth of 40 inches

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, plant competition, seedling mortality, windthrow hazard, seasonal wetness
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Trees that can withstand seasonal wetness should be selected for planting.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• If trees are planted, site preparation is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.
• Planting when the soil is moist can reduce the seedling mortality rate.

Building sites

Major management concerns: Cutbanks caving, seasonal wetness
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.

Septic tank absorption fields

Major management concerns: Seasonal wetness, moderately rapid permeability
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.

- The poor filtering capacity of this soil can result in the pollution of ground water.
- Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.

Interpretive Groups

Land capability classification: IVw
Woodland ordination symbol: 4W
Michigan soil management group: 5b-h

182—Pits, quarry

Setting

Landform: Lake plains
Shape of areas: Irregular
Size of areas: 10 to 200 acres

Composition

Pits: 100 percent

Use and Management

Land use: Source of gypsum
Management considerations:
- Onsite investigation is needed to determine the suitability for specific uses.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned

197A—Gladwin loamy sand, 0 to 3 percent slopes

Setting

Landform: Outwash plains
Shape of areas: Irregular
Size of areas: 5 to 20 acres

Typical Profile

Surface layer:
0 to 2 inches—black loamy sand

Subsurface layer:
2 to 7 inches—light brownish gray sand

Subsoil:
7 to 10 inches—dark brown, very friable sand
10 to 16 inches—yellowish brown, mottled, very friable sand
16 to 22 inches—light yellowish brown, mottled, very friable sand
22 to 26 inches—dark yellowish brown, mottled, friable very gravelly sandy loam

Substratum:
26 to 30 inches—yellowish brown, mottled very gravelly sand
30 to 80 inches—light brownish gray very gravelly sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, at a depth of 0.5 foot to 1.5 feet at some time from October through May
Surface runoff: Slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

Gladwin soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
- The very poorly drained Deford soils

Similar inclusions:
- Soils that have less gravel in the substratum
- Soils that have a surface layer of sand

Use and Management

Land use: Woodland

Woodland

Major management concerns: Equipment limitations, plant competition, seasonal wetness, seedling mortality, windthrow hazard
Management considerations:
- The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
- Trees that can withstand seasonal wetness should be selected for planting.
- Carefully managed reforestation helps to control undesirable understory plants.
- Special harvest methods may be needed to control undesirable plants.

• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Building sites

Major management concerns: Cutbanks caving, seasonal wetness
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Rapid permeability, seasonal wetness
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 5W
Michigan soil management group: 4b

209B—Grayling sand, calcareous substratum, nearly level and undulating

Setting

Landform: Deltas and river terraces
Slope range: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 50 to 2,000 acres

Typical Profile

Surface layer:
0 to 2 inches—black sand

Subsoil:
2 to 4 inches—dark yellowish brown, very friable sand
4 to 29 inches—yellowish brown, loose sand

Substratum:
29 to 70 inches—light yellowish brown sand
70 to 180 inches—yellowish brown, calcareous sand that has strata of fine sand, coarse sand, or gravelly sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Potential for frost action: Low

Composition

Grayling soil and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres soils
• The very poorly drained, dysic Borosaprists

Similar inclusions:
• Sandy soils that have a banded substratum
• Sandy soils that have a gray subsurface layer
• Sandy soils that are moderately well drained

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 4S
Michigan soil management group: 5.7a
Primary plant association: Black oak-White oak-Blueberry
Secondary plant association: Mixed oak-Red maple-Starflower

209C—Grayling sand, calcareous substratum, rolling

Setting

Landform: Deltas and river terraces
Slope range: 6 to 18 percent
Shape of areas: Irregular
Size of areas: 20 to 200 acres

Typical Profile

Surface layer:
0 to 2 inches—black sand

Subsoil:
2 to 4 inches—dark yellowish brown, very friable sand
4 to 29 inches—yellowish brown, loose sand

Substratum:
29 to 70 inches—light yellowish brown sand
70 to 180 inches—yellowish brown, calcareous sand that has strata of fine sand, coarse sand, or gravelly sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Potential for frost action: Low

Composition

Grayling soil and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Au Gres soils in slight depressions
- The very poorly drained, dysic Borosaprists in depressions

Similar inclusions:
- Sandy soils that have a banded substratum
- Sandy soils that have a gray subsurface layer
- Sandy soils that are moderately well drained

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
- Because loose sand and the slope can hinder the traction of wheeled equipment, skid roads should be built on the contour or on the gentler slopes.
- Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.
- Areas with a southern exposure may have a higher seedling mortality rate than other areas.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 4S
Michigan soil management group: 5.7a
Primary plant association: Black oak-White oak-Blueberry
Secondary plant association: Mixed oak-Red maple-Starflower

209D—Grayling sand, calcareous substratum, hilly

Setting

Landform: Deltas and river terraces
Slope range: 18 to 30 percent
Shape of areas: Linear
Size of areas: 10 to 200 acres

Typical Profile

Surface layer:
0 to 2 inches—black sand

Subsoil:
2 to 4 inches—dark yellowish brown, very friable sand
4 to 29 inches—yellowish brown, loose sand

Substratum:
29 to 70 inches—light yellowish brown sand
70 to 180 inches—yellowish brown, calcareous sand that has strata of fine sand, coarse sand, or gravelly sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Rapid

Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Potential for frost action: Low

Composition

Grayling soil and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Inclusions

Contrasting inclusions:
- Haplorthods and Eutroboralfs in landscape positions similar to those of the Grayling soil

Similar inclusions:
- Sandy soils that have a banded substratum
- Sandy soils that have a gray subsurface layer
- Sandy soils that are moderately well drained

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, erosion hazard, slope, seasonal droughtiness
Management considerations:
- Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
- The grade should be kept as low as possible.
- Because loose sand and the slope can hinder the traction of wheeled equipment, skid roads should be built on the contour or on the gentler slopes.
- Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
- The hazard of erosion can be reduced by seeding logging roads, landings, and areas that have been cut and filled and by installing water bars and culverts.
- Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.
- Areas with a southern exposure may have a higher seedling mortality rate than other areas.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 4R
Michigan soil management group: 5.7a
Primary plant association: Black oak-White oak-Blueberry
Secondary plant association: Mixed oak-Red maple-Starflower

210B—Grayling sand, nearly level and undulating

Setting

Landform: Outwash plains
Slope range: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 80 to 600 acres

Typical Profile

Surface layer:
0 to 2 inches—black sand

Subsoil:
2 to 4 inches—dark yellowish brown, very friable sand
4 to 29 inches—yellowish brown, loose sand

Substratum:
29 to 180 inches—light yellowish brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Potential for frost action: Low

Composition

Grayling soil and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Au Gres soils and the very poorly drained, dysic Borosaprists; in depressions

Similar inclusions:
- Sandy soils that have a banded substratum
- Sandy soils that have a gray subsurface layer
- Sandy soils that are moderately well drained

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
- Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.

• Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 4S
Michigan soil management group: 5.7a
Primary plant association: Black oak-White oak-Blueberry
Secondary plant association: Mixed oak-Red maple-Starflower

210C—Grayling sand, rolling

Setting

Landform: Outwash plains and deltas
Slope range: 6 to 18 percent
Shape of areas: Irregular
Size of areas: 20 to 400 acres

Typical Profile

Surface layer:
0 to 2 inches—black sand

Subsoil:
2 to 4 inches—dark yellowish brown, very friable sand
4 to 29 inches—yellowish brown, loose sand

Substratum:
29 to 180 inches—light yellowish brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Potential for frost action: Low

Composition

Grayling soil and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Inclusions

Contrasting inclusions:
• The more fertile, sandy Alfic Haplorthods and sandy Entic Haplorthods that have a loamy substratum; in landscape positions similar to those of the Grayling soil

Similar inclusions:
• Sandy soils that have a banded substratum
• Sandy soils that have a gray subsurface layer
• Sandy soils that are moderately well drained

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
• Because loose sand and the slope can hinder the traction of wheeled equipment, skid roads should be built on the contour or on the gentler slopes.
• Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.
• Areas with a southern exposure may have a higher seedling mortality rate than other areas.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 4S
Michigan soil management group: 5.7a
Primary plant association: Black oak-White oak-Blueberry
Secondary plant association: Mixed oak-Red maple-Starflower

210D—Grayling sand, hilly

Setting

Landform: Deltas
Slope range: 18 to 30 percent
Shape of areas: Linear
Size of areas: 20 to 100 acres

Typical Profile

Surface layer:
0 to 2 inches—black sand

Subsoil:
2 to 4 inches—dark yellowish brown, very friable sand
4 to 29 inches—yellowish brown, loose sand

Substratum:
29 to 180 inches—light yellowish brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low

Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Rapid
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Potential for frost action: Low

Composition

Grayling soil and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Inclusions

Contrasting inclusions:
• The more fertile, sandy Alfic Haplorthods and sandy Entic Haplorthods that have a loamy substratum; in landscape positions similar to those of the Grayling soil

Similar inclusions:
• Sandy soils that have a banded substratum
• Sandy soils that have a gray subsurface layer
• Sandy soils that are moderately well drained
• Sandy soils that have gravelly textures in the substratum

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, erosion hazard, slope, seasonal droughtiness
Management considerations:
• Because loose sand and the slope can hinder the traction of wheeled equipment, skid roads should be built on the contour or on the gentler slopes.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• The hazard of erosion can be reduced by seeding logging roads, landings, and areas that have been cut and filled and by installing water bars and culverts.
• The grade should be kept as low as possible.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.
• Areas with a southern exposure may have a higher seedling mortality rate than other areas.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 4R
Michigan soil management group: 5.7a
Primary plant association: Black oak-White oak-Blueberry
Secondary plant association: Mixed oak-Red maple-Starflower

210E—Grayling sand, steep

Setting

Landform: Deltas
Slope range: 30 to 50 percent
Shape of areas: Linear
Size of areas: 20 to 100 acres

Typical Profile

Surface layer:
0 to 2 inches—black sand

Subsoil:
2 to 4 inches—dark yellowish brown, very friable sand
4 to 29 inches—yellowish brown, loose sand

Substratum:
29 to 180 inches—light yellowish brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Rapid
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Severe
Potential for frost action: Low

Composition

Grayling soil and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Inclusions

Contrasting inclusions:
• The more fertile, sandy Entic Haplorthods that have a loamy substratum; in landscape positions similar to those of the Grayling soil

Similar inclusions:
• Sandy soils that have bands of loamy sand below a depth of 60 inches
• Sandy soils that have a gray subsurface layer
• Sandy soils that have gravelly textures in the substratum

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, erosion hazard, slope, seasonal droughtiness
Management considerations:
• Because loose sand and the slope can hinder the traction of wheeled equipment, skid roads should be built on the contour or on the gentler slopes.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• The grade should be kept as low as possible.
• Ordinary crawler tractors and rubber-tired skidders cannot be operated safely because of the slope. As a result, special logging methods, such as yarding the logs with a cable, may be needed.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• The hazard of erosion can be reduced by seeding logging roads, landings, and areas that have been cut and filled and by installing water bars and culverts.
• Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
• Planting when the soil is moist can reduce the seedling mortality rate.
• Areas with a southern exposure may have a higher seedling mortality rate than other areas.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 4R
Michigan soil management group: 5.7a
Primary plant association: Black oak-White oak-Blueberry
Secondary plant association: Mixed oak-Red maple-Starflower

211B—Grayling sand, banded substratum, nearly level and undulating

Setting

Landform: Outwash plains
Slope range: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 20 to 100 acres

Typical Profile

Surface layer:
0 to 3 inches—black sand

Subsoil:
3 to 15 inches—dark yellowish brown, very friable sand
15 to 35 inches—yellowish brown, loose sand

Substratum:
35 to 60 inches—light yellowish brown sand
60 to 80 inches—light yellowish brown sand and bands of yellowish brown loamy sand
80 to 180 inches—light yellowish brown sand that has strata of fine sand, coarse sand, or loamy sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Potential for frost action: Low

Composition

Grayling soil and similar soils: 70 to 90 percent
Contrasting inclusions: 10 to 30 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres soils and the very poorly drained Leafriver and Wakeley soils and dysic Borosaprists; in depressions
• The sandy Entic Haplorthods that have a loamy substratum; in landscape positions similar to those of the Grayling soil

Similar inclusions:
- Sandy soils that are not banded
- Sandy soils that have a gray subsurface layer
- Sandy soils that are moderately well drained
- Sandy soils that have gravelly textures in the substratum

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
- Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 4S
Michigan soil management group: 5.7a
Primary plant association: Black oak-White oak-Blueberry
Secondary plant association: Mixed oak-Red maple-Starflower

212B—Grayling sand, very deep water table, nearly level and undulating

Setting

Landform: Outwash plains
Slope range: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 80 to 600 acres

Typical Profile

Surface layer:
0 to 3 inches—black sand

Subsoil:
3 to 10 inches—dark yellowish brown, very friable sand
10 to 30 inches—yellowish brown, loose sand

Substratum:
30 to 70 inches—light yellowish brown sand
70 to 100 inches—light yellowish brown, mottled sand
100 to 180 inches—yellowish brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: Apparent, at a depth of 6 to 15 feet at some time from January through December
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Potential for frost action: Low

Composition

Grayling soil and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Au Gres soils
- The very poorly drained Leafriver and Wakeley soils and dysic Borosaprists; in depressions

Similar inclusions:
- Sandy soils that have a banded substratum
- Sandy soils that have a gray subsurface layer
- Sandy soils that are moderately well drained
- Sandy soils that have a water table below a depth of 15 feet
- Sandy soils that have gravelly textures in the substratum

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
- Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 4S
Michigan soil management group: 5.7a
Primary plant association: Black oak-White oak-Blueberry

Secondary plant association: Mixed oak-Red maple-Starflower

213B—Graycalm sand, nearly level and undulating

Setting

Landform: Outwash plains and deltas
Slope range: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 10 to 40 acres

Typical Profile

Surface layer:
0 to 1 inch—black sand

Subsoil:
1 to 4 inches—strong brown, very friable sand
4 to 46 inches—strong brown, very friable loamy sand
46 to 70 inches—light yellowish brown, loose sand with bands of brown, very friable loamy sand

Substratum:
70 to 180 inches—stratified coarse sand to loamy sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Potential for frost action: Low

Composition

Graycalm soil and similar soils: 70 to 90 percent
Contrasting inclusions: 10 to 30 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Au Gres soils
- The very poorly drained, dysic Borosaprists; in depressions

Similar inclusions:
- Sandy soils that have a gray subsurface layer
- Sandy soils that have a mottled subsoil between depths of 20 and 40 inches
- Sandy soils that have a dark brown subsoil
- Sandy soils that have a banded substratum

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
- Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 6S
Michigan soil management group: 5a
Primary plant association: Black oak-White oak-Blueberry
Secondary plant association: Mixed oak-Red maple-Starflower

214B—Typic Udipsamments, deep water table, nearly level and undulating

Setting

Landform: Outwash plains
Slope range: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Reference Profile

Surface layer:
0 to 2 inches—black sand

Subsoil:
2 to 22 inches—dark yellowish brown, loose sand

Substratum:
22 to 37 inches—yellowish brown sand
37 to 80 inches—brownish yellow, mottled sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: Apparent, at a depth of 3.5 to 6.0 feet at some time from October through May
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Potential for frost action: Low

Composition

Typic Udipsamments and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Au Gres soils and Typic Duraquods
- The very poorly drained Leafriver and Wakeley soils and dysic Borosaprists; in depressions

Similar inclusions:
- Sandy soils that have a banded substratum
- Sandy soils that have a gray subsurface layer
- Sandy soils that have gravelly textures in the substratum

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
- Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 2S
Michigan soil management group: 5.7a
Primary plant association: Black oak-White oak-Blueberry
Secondary plant association: Mixed oak-Red maple-Starflower

215B—Typic Udipsamments, loamy substratum, nearly level and undulating

Setting

Landform: Outwash plains and deltas
Slope range: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 10 to 20 acres

Reference Profile

Surface layer:
0 to 2 inches—very dark grayish brown sand

Subsoil:
2 to 15 inches—dark yellowish brown, very friable sand
15 to 25 inches—yellowish brown, loose sand

Substratum:
25 to 75 inches—brownish yellow sand
75 to 95 inches—strong brown sandy clay loam

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Potential for frost action: Low

Composition

Typic Udipsamments and similar soils: 70 to 90 percent
Contrasting inclusions: 10 to 30 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Au Gres soils and Argic Endoaquods
- The very poorly drained, dysic Borosaprists in depressions and drainageways
- The sandy Entic Haplorthods that have a loamy substratum; in landscape positions similar to those of the Typic Udipsamments

Similar inclusions:
- Sandy soils that are moderately well drained
- Sandy soils that have a coarse textured substratum
- Sandy soils that have a surface layer of loamy sand or fine sand
- Sandy soils that have a banded substratum

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
- Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary plant association: Black oak-White oak-Blueberry
Secondary plant association: Mixed oak-Red maple-Starflower

216B—Typic Udipsamments, loamy calcareous substratum, nearly level and undulating

Setting

Landform: Outwash plains and deltas
Slope range: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 20 to 200 acres

Reference Profile

Surface layer:
0 to 2 inches—very dark grayish brown sand

Subsoil:
2 to 15 inches—dark yellowish brown, very friable sand
15 to 25 inches—yellowish brown, loose sand

Substratum:
25 to 75 inches—brownish yellow sand
75 to 95 inches—strong brown, calcareous sandy clay loam

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Potential for frost action: Low

Composition

Typic Udipsamments and similar soils: 70 to 90 percent
Contrasting inclusions: 10 to 30 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres soils and Argic Endoaquods
• The very poorly drained, dysic Borosaprists in depressions and drainageways
• The sandy Entic Haplorthods that have a loamy substratum; in landscape positions similar to those of the Typic Udipsamments

Similar inclusions:
• Sandy soils that are moderately well drained
• Sandy soils that have a coarse textured substratum
• Sandy soils that have a surface layer of loamy sand or fine sand
• Sandy soils that have a banded substratum

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: 3S
Michigan soil management group: None assigned
Primary plant association: Black oak-White oak-Blueberry
Secondary plant association: Mixed oak-Red maple-Starflower

220B—Typic Udipsamments, nearly level and undulating

Setting

Landform: Moraines and deltas
Slope range: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 20 to 50 acres

Reference Profile

Surface layer:
0 to 2 inches—very dark gray sand

Subsurface layer:
2 to 4 inches—light brownish gray sand

Subsoil:
4 to 22 inches—dark yellowish brown, very friable sand
22 to 40 inches—yellowish brown, loose sand

Substratum:
40 to 180 inches—light yellowish brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Potential for frost action: Low

Composition

Typic Udipsamments and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Au Gres soils
- The very poorly drained Leafriver and Wakeley soils and dysic Borosaprists; in depressions and drainageways
- The well drained Eutroboralfs in landscape positions similar to those of the Typic Udipsamments

Similar inclusions:
- Sandy soils that are moderately well drained
- Sandy soils that have a fine textured substratum
- Sandy soils that have a surface layer of loamy sand or fine sand

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
- Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary plant association: Mixed oak-Red maple-Starflower
Secondary plant association: Black oak-White oak-Blueberry

220D—Typic Udipsamments, hilly

Setting

Landform: Moraines and deltas
Slope range: 18 to 30 percent
Shape of areas: Linear
Size of areas: 10 to 50 acres

Reference Profile

Surface layer:
0 to 2 inches—very dark gray sand

Subsurface layer:
2 to 4 inches—light brownish gray sand

Subsoil:
4 to 12 inches—yellowish brown, very friable sand
12 to 40 inches—brownish yellow, loose sand

Substratum:
40 to 180 inches—light yellowish brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Potential for frost action: Low

Composition

Typic Udipsamments and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Inclusions

Contrasting inclusions:
- The well drained Eutroboralfs in landscape positions similar to those of the Typic Udipsamments

Similar inclusions:
- Sandy soils that have a banded substratum
- Sandy soils that have a surface layer of loamy sand or fine sand
- Sandy soils that have a gravelly substratum

Use and Management

Land use: Woodland

Major management concerns: Equipment limitations, erosion hazard, seedling mortality, slope, seasonal droughtiness

Management considerations:

- Because loose sand and the slope can hinder the traction of wheeled equipment, skid roads should be built on the contour or on the gentler slopes.
- Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
- The grade should be kept as low as possible.
- Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
- The hazard of erosion can be reduced by seeding logging roads and landings and by installing water bars and culverts.
- Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.
- Areas with a southern exposure may have a higher seedling mortality rate than other areas.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary plant association: Mixed oak-Red maple-Starflower
Secondary plant association: Black oak-White oak-Blueberry

220E—Typic Udipsamments, steep

Setting

Landform: Moraines and deltas
Slope range: 30 to 50 percent
Shape of areas: Linear
Size of areas: 10 to 100 acres

Reference Profile

Surface layer:
0 to 2 inches—very dark gray sand

Subsurface layer:
2 to 4 inches—light brownish gray sand

Subsoil:
4 to 12 inches—yellowish brown, very friable sand
12 to 40 inches—brownish yellow, loose sand

Substratum:
40 to 180 inches—light yellowish brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Rapid
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Severe
Potential for frost action: Low

Composition

Typic Udipsamments and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Inclusions

Contrasting inclusions:

- The well drained, sandy over loamy Alfic Haplorthods and the well drained Eutroboralfs; in landscape positions similar to those of the Typic Udipsamments

Similar inclusions:

- Sandy soils that have fine textured bands in the substratum
- Sandy soils that have a surface layer of loamy sand or fine sand
- Sandy soils that have a gravelly substratum

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, erosion hazard, slope, seasonal droughtiness

Management considerations:

- Because loose sand and the slope can hinder the traction of wheeled equipment, skid roads should be built on the contour or on the gentler slopes.
- Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
- The grade should be kept as low as possible.
- Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
- The hazard of erosion can be reduced by seeding logging roads, landings, and areas that have been cut and filled and by installing water bars and culverts.
- Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.

• Areas with a southern exposure may have a higher seedling mortality rate than other areas.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary plant association: Mixed oak-Red maple-Starflower
Secondary plant association: Black oak-White oak-Blueberry

221B—Typic Udipsamments, banded substratum, nearly level and undulating

Setting

Landform: Moraines and deltas
Slope range: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 20 to 400 acres

Reference Profile

Surface layer:
0 to 3 inches—very dark gray sand

Subsoil:
3 to 6 inches—dark brown, very friable sand
6 to 20 inches—strong brown, loose sand
20 to 30 inches—brownish yellow, loose sand

Substratum:
30 to 45 inches—light yellowish brown sand
45 to 75 inches—light yellowish brown sand that has bands of dark yellowish brown loamy sand
75 to 85 inches—brown loamy sand
85 to 180 inches—light yellowish brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Potential for frost action: Low

Composition

Typic Udipsamments and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres soils
• The very poorly drained Leafriver and Wakeley soils and dysic Borosaprists; in depressions and drainageways
• The well drained Eutroboralfs and sandy over loamy Alfic Haplorthods; in landscape positions similar to those of the Typic Udipsamments

Similar inclusions:
• Sandy soils that are moderately well drained
• Sandy soils that have fine textured bands in the substratum
• Sandy soils that have a surface layer of loamy sand or fine sand
• Sandy soils that have a gravelly substratum

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary plant association: Mixed oak-Red maple-Starflower
Secondary plant association: Black oak-White oak-Blueberry

221C—Typic Udipsamments, banded substratum, rolling

Setting

Landform: Moraines
Slope range: 6 to 18 percent
Shape of areas: Irregular
Size of areas: 20 to 400 acres

Reference Profile

Surface layer:
0 to 3 inches—very dark gray sand

Subsoil:
3 to 6 inches—dark brown, very friable sand
6 to 20 inches—strong brown, loose sand
20 to 30 inches—brownish yellow, loose sand

Substratum:
30 to 45 inches—light yellowish brown sand
45 to 75 inches—light yellowish brown sand that has bands of dark yellowish brown loamy sand
75 to 85 inches—brown loamy sand
85 to 180 inches—light yellowish brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Potential for frost action: Low

Composition

Typic Udipsamments and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres soils
• The very poorly drained Leafriver and Wakeley soils and dysic Borosaprists; in depressions and drainageways
• The well drained Eutroboralfs and sandy over loamy Alfic Haplorthods; in landscape positions similar to those of the Typic Udipsamments

Similar inclusions:
• Sandy soils that are moderately well drained
• Sandy soils that have fine textured bands in the substratum
• Sandy soils that have a surface layer of loamy sand or fine sand
• Sandy soils that have a gravelly substratum

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
• Because loose sand and the slope can hinder the traction of wheeled equipment, skid roads should be built on the contour or on the gentler slopes.
• Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.
• Areas with a southern exposure may have a higher seedling mortality rate than other areas.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary plant association: Mixed oak-Red maple-Starflower
Secondary plant association: Black oak-White oak-Blueberry

221D—Typic Udipsamments, banded substratum, hilly

Setting

Landform: Moraines and deltas
Slope range: 18 to 30 percent
Shape of areas: Linear
Size of areas: 10 to 200 acres

Reference Profile

Surface layer:
0 to 3 inches—very dark gray sand

Subsoil:
3 to 6 inches—dark brown, very friable sand
6 to 20 inches—strong brown, loose sand
20 to 30 inches—brownish yellow, loose sand

Substratum:
30 to 45 inches—light yellowish brown sand
45 to 75 inches—light yellowish brown sand that has bands of dark yellowish brown loamy sand
75 to 85 inches—brown loamy sand
85 to 180 inches—light yellowish brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Potential for frost action: Low

Composition

Typic Udipsamments and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Inclusions

Contrasting inclusions:
• The sandy over loamy Alfic Haplorthods and the sandy Entic Haplorthods that have a loamy substratum; in landscape positions similar to those of the Typic Udipsamments

Similar inclusions:
• Sandy soils that have fine textured bands in the substratum
• Sandy soils that have a surface layer of loamy sand or fine sand
• Sandy soils that have a gravelly substratum

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, erosion hazard, slope, seasonal droughtiness
Management considerations:
• Because loose sand and the slope can hinder the traction of wheeled equipment, skid roads should be built on the contour or on the gentler slopes.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• The hazard of erosion can be reduced by seeding logging roads, landings, and areas that have been cut and filled and by installing water bars and culverts.
• Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.
• Areas with a southern exposure may have a higher seedling mortality rate than other areas.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary plant association: Mixed oak-Red maple-Starflower
Secondary plant association: Black oak-White oak-Blueberry

221E—Typic Udipsamments, banded substratum, steep

Setting

Landform: Moraines and deltas
Slope range: 30 to 50 percent
Shape of areas: Linear
Size of areas: 10 to 200 acres

Reference Profile

Surface layer:
0 to 3 inches—very dark gray sand

Subsoil:
3 to 6 inches—dark brown, very friable sand
6 to 20 inches—strong brown, loose sand
20 to 30 inches—brownish yellow, loose sand

Substratum:
30 to 60 inches—light yellowish brown sand
60 to 75 inches—light yellowish brown sand that has bands of dark yellowish brown loamy sand
75 to 85 inches—brown loamy sand
85 to 180 inches—light yellowish brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Rapid
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Severe
Potential for frost action: Low

Composition

Typic Udipsamments and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres soils and Argic Endoaquods
• The very poorly drained, dysic Borosaprists in depressions and drainageways
• The well drained Klacking soils and Eutroboralfs; in landscape positions similar to those of the Typic Udipsamments

Similar inclusions:
• Sandy soils that are moderately well drained

• Sandy soils that have a surface layer of loamy sand or fine sand
• Sandy soils that have gravelly sand in the substratum
• Sandy soils that have bands in the lower part of the subsoil

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, erosion hazard, slope, seasonal droughtiness
Management considerations:
• Because loose sand and the slope can hinder the traction of wheeled equipment, skid roads should be built on the contour or on the gentler slopes.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• Ordinary crawler tractors and rubber-tired skidders cannot be operated safely because of the slope. As a result, special logging methods, such as yarding the logs with a cable, may be needed.
• The hazard of erosion can be reduced by seeding logging roads, landings, and areas that have been cut and filled and by installing water bars and culverts.
• Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.
• Areas with a southern exposure may have a higher seedling mortality rate than other areas.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary plant association: Mixed oak-Red maple-Starflower
Secondary plant association: Black oak-White oak-Blueberry

222B—Typic Udipsamments, very deep water table, nearly level and undulating

Setting

Landform: Outwash plains
Slope range: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 20 to 400 acres

Reference Profile

Surface layer:
0 to 2 inches—very dark gray sand

Subsoil:
2 to 5 inches—dark brown, very friable sand
5 to 15 inches—strong brown, loose sand
15 to 30 inches—yellowish brown, loose sand

Substratum:
30 to 80 inches—light yellowish brown sand
80 to 90 inches—yellowish brown, mottled sand
90 to 100 inches—yellowish brown, saturated sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: Apparent, at a depth of 5 to 15 feet at some time from January through December
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Potential for frost action: Low

Composition

Typic Udipsamments and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres soils
• The very poorly drained Leafriver and Wakeley soils and dysic Borosaprists; in depressions and drainageways

Similar inclusions:
• Sandy soils that have a fine textured substratum
• Sandy soils that have a surface layer of loamy sand or fine sand
• Sandy soils that do not have mottles in the substratum
• Sandy soils that have a gravelly substratum

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.

• Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary plant association: Mixed oak-Red maple-Starflower
Secondary plant association: Black oak-White oak-Blueberry

223B—Graycalm-Grayling sands, nearly level and undulating

Setting

Landform: Outwash plains and deltas
Slope range: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 20 to 200 acres

Typical Profile

Graycalm

Surface layer:
0 to 1 inch—black sand

Subsoil:
1 to 4 inches—strong brown, very friable sand
4 to 46 inches—strong brown, loose loamy sand
46 to 70 inches—light yellowish brown, loose sand with bands of brown, very friable loamy sand

Substratum:
70 to 180 inches—stratified coarse sand to loamy sand

Grayling

Surface layer:
0 to 2 inches—black sand

Subsoil:
2 to 4 inches—dark yellowish brown, very friable sand
4 to 29 inches—yellowish brown, loose sand

Substratum:
29 to 180 inches—light yellowish brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Graycalm—somewhat excessively drained; Grayling—excessively drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Potential for frost action: Low

Composition

Graycalm, Grayling, and similar soils: 70 to 90 percent
Contrasting inclusions: 10 to 30 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres soils
• The very poorly drained Leafriver and Wakeley soils and dysic Borosaprists; in depressions and drainageways

Similar inclusions:
• Sandy soils that are moderately well drained
• Sandy soils that have a surface layer of loamy sand or fine sand
• Sandy soils that have a gravelly substratum

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: Graycalm—6S; Grayling—4S
Michigan soil management group: Graycalm—5a; Grayling—5.7a
Primary plant association: Mixed oak-Red maple-Starflower
Secondary plant association: Black oak-White oak-Blueberry

223C—Graycalm-Grayling sands, rolling

Setting

Landform: Outwash plains and deltas
Slope range: 6 to 18 percent

Shape of areas: Irregular
Size of areas: 20 to 80 acres

Typical Profile

Graycalm

Surface layer:
0 to 1 inch—black sand

Subsoil:
1 to 4 inches—strong brown, very friable sand
4 to 46 inches—strong brown, loose loamy sand
46 to 70 inches—light yellowish brown, loose sand with bands of brown, very friable loamy sand

Substratum:
70 to 180 inches—stratified coarse sand to loamy sand

Grayling

Surface layer:
0 to 2 inches—black sand

Subsoil:
2 to 4 inches—dark yellowish brown, very friable sand
4 to 29 inches—yellowish brown, loose sand

Substratum:
29 to 180 inches—light yellowish brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Graycalm—somewhat excessively drained; Grayling—excessively drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Potential for frost action: Low

Composition

Graycalm, Grayling, and similar soils: 70 to 90 percent
Contrasting inclusions: 10 to 30 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres soils
• The very poorly drained Leafriver and Wakeley soils and dysic Borosaprists; in depressions and drainageways
• The well drained, sandy over loamy Alfic Haplorthods and the well drained Eutroboralfs; in landscape positions similar to those of the major soils

Similar inclusions:
• Sandy soils that are moderately well drained
• Sandy soils that have a gravelly substratum
• Sandy soils that have a surface layer of loamy sand or fine sand

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
• Because loose sand and the slope can hinder the traction of wheeled equipment, skid roads should be built on the contour or on the gentler slopes.
• Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.
• Areas with a southern exposure may have a higher seedling mortality rate than other areas.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: Graycalm—6S; Grayling—4S
Michigan soil management group: Graycalm—5a; Grayling—5.7a
Primary plant association: Mixed oak-Red maple-Starflower
Secondary plant association: Black oak-White oak-Blueberry

223D—Graycalm-Grayling sands, hilly

Setting

Landform: Outwash plains and deltas
Slope range: 18 to 30 percent
Shape of areas: Linear
Size of areas: 10 to 20 acres

Typical Profile

Graycalm

Surface layer:
0 to 1 inch—black sand

Subsoil:
1 to 4 inches—strong brown, very friable sand
4 to 46 inches—strong brown, loose loamy sand
46 to 70 inches—light yellowish brown, loose sand with bands of brown, very friable loamy sand

Substratum:
70 to 180 inches—stratified coarse sand to loamy sand

Grayling

Surface layer:
0 to 2 inches—black sand

Subsoil:
2 to 4 inches—dark yellowish brown, very friable sand
4 to 29 inches—yellowish brown, loose sand

Substratum:
29 to 180 inches—light yellowish brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Graycalm—somewhat excessively drained; Grayling—excessively drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Rapid
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Potential for frost action: Low

Composition

Graycalm, Grayling, and similar soils: 70 to 90 percent
Contrasting inclusions: 10 to 30 percent

Inclusions

Contrasting inclusions:
• The well drained, sandy over loamy Alfic Haplorthods and the well drained Eutroboralfs; in landscape positions similar to those of the major soils

Similar inclusions:
• Sandy soils that have coarse textured bands in the substratum
• Sandy soils that have a surface layer of loamy sand or fine sand
• Sandy soils that have a gravelly substratum

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, erosion hazard, seasonal droughtiness
Management considerations:
• Because loose sand and the slope can hinder the traction of wheeled equipment, skid roads should be built on the contour or on the gentler slopes.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• The grade should be kept as low as possible.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• The hazard of erosion can be reduced by seeding logging roads, landings, and areas that have been cut and filled and by installing water bars and culverts.
• Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.
• Areas with a southern exposure may have a higher seedling mortality rate than other areas.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: Graycalm—6R; Grayling—4R
Michigan soil management group: Graycalm—5a; Grayling—5.7a
Primary plant association: Mixed oak-Red maple-Starflower
Secondary plant association: Black oak-White oak-Blueberry

223E—Graycalm-Grayling sands, steep

Setting

Landform: Outwash plains and deltas
Slope range: 30 to 50 percent
Shape of areas: Linear
Size of areas: 10 to 40 acres

Typical Profile

Graycalm

Surface layer:
0 to 1 inch—black sand

Subsoil:
1 to 4 inches—strong brown, very friable sand
4 to 46 inches—strong brown, loose loamy sand
46 to 70 inches—light yellowish brown, loose sand with bands of brown, very friable loamy sand

Substratum:
70 to 180 inches—stratified coarse sand to loamy sand

Grayling

Surface layer:
0 to 2 inches—black sand

Subsoil:
2 to 4 inches—dark yellowish brown, very friable sand
4 to 29 inches—yellowish brown, loose sand

Substratum:
29 to 180 inches—light yellowish brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Graycalm—somewhat excessively drained; Grayling—excessively drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Rapid
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Severe
Potential for frost action: Low

Composition

Graycalm, Grayling, and similar soils: 70 to 90 percent
Contrasting inclusions: 10 to 30 percent

Inclusions

Contrasting inclusions:
- The well drained, sandy over loamy Alfic Haplorthods and the well drained Eutroboralfs; in landscape positions similar to those of the major soils

Similar inclusions:
- Sandy soils that have coarse textured bands in the substratum
- Sandy soils that have a surface layer of loamy sand or fine sand
- Sandy soils that have a gravelly substratum

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, erosion hazard, seasonal droughtiness, slope
Management considerations:
- Ordinary crawler tractors and rubber-tired skidders cannot be operated safely because of the slope. As a result, special logging methods, such as yarding the logs with a cable, may be needed.
- Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
- The grade should be kept as low as possible.
- Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
- The hazard of erosion can be reduced by seeding logging roads, landings, and areas that have been cut and filled and by installing water bars and culverts.
- Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.
- Areas with a southern exposure may have a higher seedling mortality rate than other areas.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: Graycalm—6R; Grayling—4R
Michigan soil management group: Graycalm—5a; Grayling—5.7a
Primary plant association: Mixed oak-Red maple-Starflower
Secondary plant association: Black oak-White oak-Blueberry

224B—Croswell sand, nearly level and undulating

Setting

Landform: Outwash plains
Slope range: 0 to 4 percent
Shape of areas: Irregular
Size of areas: 20 to 200 acres

Typical Profile

Organic mat:
0 to 1 inch—black, well decomposed forest leaf litter

Subsurface layer:
1 to 4 inches—dark grayish brown sand

Subsoil:
4 to 10 inches—dark brown, very friable sand
10 to 20 inches—strong brown, loose sand
20 to 29 inches—brownish yellow, mottled, loose sand

Substratum:
29 to 99 inches—yellowish brown and light yellowish brown, mottled sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: Apparent, at a depth of 2.0 to 3.5 feet at some time from November through May
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Potential for frost action: Low

Composition

Croswell soil and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Inclusions

Contrasting inclusions:
• The very poorly drained Leafriver and Wakeley soils and dysic Borosaprists; in depressions and drainageways

Similar inclusions:
• Sandy soils that have a banded substratum
• Sandy soils that have a surface layer of loamy sand
• Sandy soils that do not have mottles in the substratum
• Sandy soils that are moderately well drained

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition, seasonal droughtiness
Management considerations:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Special harvest methods may be needed to control undesirable plants.
• Carefully managed reforestation helps to control undesirable understory plants.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 5S
Michigan soil management group: 5a
Primary plant association: Mixed oak-Red maple-Starflower
Secondary plant association: Black oak-White oak-Blueberry

225B—Entic Haplorthods, sandy, loamy substratum, nearly level and undulating

Setting

Landform: Moraines
Slope range: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 20 to 100 acres

Reference Profile

Surface layer:
0 to 2 inches—very dark gray sand

Subsurface layer:
2 to 4 inches—grayish brown sand

Subsoil:
4 to 8 inches—dark brown, very friable sand
8 to 15 inches—dark yellowish brown, loose sand
15 to 30 inches—yellowish brown, loose sand

Substratum:
30 to 55 inches—strong brown sand
55 to 80 inches—reddish brown sandy clay loam

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Potential for frost action: Low

Composition

Entic Haplorthods and similar soils: 70 to 90 percent
Contrasting inclusions: 10 to 30 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres soils
• The very poorly drained Leafriver and Wakeley soils and dysic Borosaprists; in depressions and drainageways
• The well drained Eutroboralfs in landscape positions similar to those of the Entic Haplorthods

Similar inclusions:
• Sandy soils that are moderately well drained
• Sandy soils that have a coarse textured substratum
• Sandy soils that have a surface layer of loamy sand or fine sand

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
• Because loose sand can interfere with the traction of

wheeled equipment, logging roads should be stabilized.
- Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary plant association: Mixed oak-Red maple-Starflower
Secondary plant association: Northern red oak-Red maple-Mapleleaf viburnum

225C—Entic Haplorthods, sandy, loamy substratum, rolling

Setting

Landform: Moraines
Slope range: 6 to 18 percent
Shape of areas: Irregular
Size of areas: 20 to 100 acres

Reference Profile

Surface layer:
0 to 2 inches—very dark gray sand

Subsurface layer:
2 to 4 inches—grayish brown sand

Subsoil:
4 to 8 inches—dark brown, very friable sand
8 to 15 inches—strong brown, loose sand
15 to 30 inches—yellowish brown, loose sand

Substratum:
30 to 55 inches—strong brown sand
55 to 80 inches—reddish brown sandy clay loam

Soil Properties and Qualities

Permeability: Rapid in the sandy part and moderately slow in the loamy part
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Potential for frost action: Low

Composition

Entic Haplorthods and similar soils: 70 to 90 percent
Contrasting inclusions: 10 to 30 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Au Gres soils
- The very poorly drained Leafriver and Wakeley soils and dysic Borosaprists; in depressions and drainageways
- The well drained Eutroboralfs in landscape positions similar to those of the Entic Haplorthods

Similar inclusions:
- Sandy soils that are moderately well drained
- Sandy soils that have a coarse textured substratum
- Sandy soils that have a surface layer of loamy sand or fine sand

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
- Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.
- Areas with a southern exposure may have a higher seedling mortality rate than other areas.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary plant association: Mixed oak-Red maple-Starflower
Secondary plant association: Northern red oak-Red maple-Mapleleaf viburnum

231D—Entic Haplorthods, sandy, banded substratum-Alfic Haplorthods, sandy, complex, hilly

Setting

Landform: Moraines
Slope range: 18 to 30 percent
Shape of areas: Linear
Size of areas: 10 to 20 acres

Reference Profile

Entic Haplorthods

Surface layer:
0 to 2 inches—very dark gray sand

Subsurface layer:
2 to 4 inches—brown sand

Subsoil:
4 to 8 inches—dark brown, very friable sand
8 to 20 inches—strong brown, loose sand
20 to 30 inches—brownish yellow, loose sand

Substratum:
30 to 60 inches—light yellowish brown sand
60 to 75 inches—light yellowish brown sand that has bands of dark yellowish brown loamy sand
75 to 85 inches—brown loamy sand
85 to 180 inches—light yellowish brown sand

Alfic Haplorthods

Organic mat:
0 to 2 inches—partially decomposed hardwood leaf litter

Surface layer:
2 to 4 inches—very dark gray loamy sand

Subsurface layer:
4 to 7 inches—grayish brown sand

Subsoil:
7 to 10 inches—dark brown, very friable loamy sand
10 to 17 inches—strong brown, loose sand
17 to 37 inches—yellowish brown, loose sand
37 to 42 inches—dark brown, very friable sandy loam

Substratum:
42 to 77 inches—reddish yellow sand
77 to 180 inches—brownish yellow sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Entic Haplorthods—excessively drained; Alfic Haplorthods—well drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Entic Haplorthods—severe; Alfic Haplorthods—moderate
Potential for frost action: Low

Composition

Entic Haplorthods and similar soils: 40 to 70 percent
Alfic Haplorthods and similar soils: 20 to 50 percent
Contrasting inclusions: 5 to 30 percent

Inclusions

Contrasting inclusions:
• The very poorly drained, dysic and euic Borosaprists in depressions and drainageways

Similar inclusions:
• Sandy soils that have a loamy substratum

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, erosion hazard, slope, and seasonal droughtiness in areas of both soils; plant competition an additional concern in areas of the Alfic Haplorthods
Management considerations:
• Because loose sand and the slope can hinder the traction of wheeled equipment, skid roads should be built on the contour or on the gentler slopes.
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• The grade should be kept as low as possible.
• The hazard of erosion can be reduced by seeding logging roads, landings, and areas that have been cut and filled and by installing water bars and culverts.
• Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.
• Areas with a southern exposure may have a higher seedling mortality rate than other areas.
• Carefully managed reforestation helps to control undesirable understory plants.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary plant association: Northern red oak-Red maple-Mapleleaf viburnum
Secondary plant association: Mixed oak-Red maple-Starflower

231E—Entic Haplorthods, sandy, banded substratum-Alfic Haplorthods, sandy, complex, steep

Setting

Landform: Moraines
Slope range: 30 to 50 percent

Shape of areas: Linear
Size of areas: 10 to 40 acres

Reference Profile

Entic Haplorthods

Surface layer:
0 to 2 inches—very dark gray sand

Subsurface layer:
2 to 4 inches—brown sand

Subsoil:
4 to 8 inches—dark brown, very friable sand
8 to 20 inches—strong brown, loose sand
20 to 30 inches—brownish yellow, loose sand

Substratum:
30 to 60 inches—light yellowish brown sand
60 to 75 inches—light yellowish brown sand that has bands of dark yellowish brown loamy sand
75 to 85 inches—brown loamy sand
85 to 180 inches—light yellowish brown sand

Alfic Haplorthods

Organic mat:
0 to 2 inches—partially decomposed hardwood leaf litter

Surface layer:
2 to 4 inches—very dark gray sand

Subsurface layer:
4 to 7 inches—grayish brown sand

Subsoil:
7 to 10 inches—dark brown, very friable loamy sand
10 to 17 inches—strong brown, loose sand
17 to 37 inches—yellowish brown, loose sand
37 to 42 inches—dark brown, very friable sandy loam

Substratum:
42 to 77 inches—reddish yellow sand
77 to 180 inches—brownish yellow sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Entic Haplorthods—excessively drained; Alfic Haplorthods—well drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Rapid
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Entic Haplorthods—severe; Alfic Haplorthods—moderate
Potential for frost action: Low

Composition

Entic Haplorthods and similar soils: 40 to 70 percent
Alfic Haplorthods and similar soils: 20 to 50 percent
Contrasting inclusions: 5 to 30 percent

Inclusions

Contrasting inclusions:
- The very poorly drained, dysic and euic Borosaprists in depressions and drainageways

Similar inclusions:
- Sandy soils that have a loamy substratum

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, erosion hazard, slope, and seasonal droughtiness in areas of both soils; plant competition an additional concern in areas of the Alfic Haplorthods
Management considerations:
- Ordinary crawler tractors and rubber-tired skidders cannot be operated safely because of the slope. As a result, special logging methods, such as yarding the logs with a cable, may be needed.
- Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
- The hazard of erosion can be reduced by seeding logging roads, landings, and areas that have been cut and filled and by installing water bars and culverts.
- Planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
- Planting when the soil is moist can also reduce the seedling mortality rate.
- Areas with a southern exposure may have a higher seedling mortality rate than other areas.
- Carefully managed reforestation helps to control undesirable understory plants.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary plant association: Northern red oak-Red maple-Mapleleaf viburnum
Secondary plant association: Mixed oak-Red maple-Starflower

232B—Entic Haplorthods, sandy-Alfic Haplorthods, sandy, complex, very deep water table, nearly level and undulating

Setting

Landform: Outwash plains and deltas
Slope range: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Reference Profile

Entic Haplorthods

Surface layer:
0 to 2 inches—very dark gray sand

Subsurface layer:
2 to 3 inches—grayish brown sand

Subsoil:
3 to 7 inches—dark brown, very friable sand
7 to 15 inches—strong brown, loose sand
15 to 30 inches—yellowish brown, loose sand

Substratum:
30 to 80 inches—light yellowish brown, mottled sand
80 to 90 inches—yellowish brown, mottled sand
90 to 100 inches—yellowish brown, saturated sand

Alfic Haplorthods

Organic mat:
0 to 2 inches—partially decomposed hardwood leaf litter

Surface layer:
2 to 4 inches—very dark gray sand

Subsurface layer:
4 to 7 inches—grayish brown sand

Subsoil:
7 to 10 inches—dark brown, very friable loamy sand
10 to 17 inches—strong brown, loose sand
17 to 37 inches—yellowish brown, loose sand
37 to 42 inches—dark brown, very friable sandy loam

Substratum:
42 to 70 inches—reddish yellow, mottled sand
70 to 180 inches—brownish yellow, saturated sand

Soil Properties and Qualities

Permeability: Entic Haplorthods—rapid; Alfic Haplorthods—rapid in the sandy part and moderately slow in the loamy part
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: Apparent, at a depth of 5 to 15 feet at some time from October through May
Surface runoff: Slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Entic Haplorthods—severe; Alfic Haplorthods—moderate
Potential for frost action: Low

Composition

Entic Haplorthods and similar soils: 40 to 70 percent
Alfic Haplorthods and similar soils: 20 to 50 percent
Contrasting inclusions: 5 to 30 percent

Inclusions

Contrasting inclusions:
- The very poorly drained Leafriver and Wakeley soils and dysic and euic Borosaprists; in depressions and drainageways

Similar inclusions:
- Sandy soils that have a loamy substratum
- Sandy soils that have a banded substratum

Use and Management

Land use: Woodland
Major management concerns: Alfic Haplorthods—plant competition; Entic Haplorthods—equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
- Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.
- Carefully managed reforestation helps to control undesirable understory plants.
- Special harvest methods may be needed to control undesirable plants.

Interpretive Groups

Land capability classification: VIs
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary plant association: Northern red oak-Red maple-Mapleleaf viburnum
Secondary plant association: Mixed oak-Red maple-Starflower

233B—Alfic Haplorthods, sandy-Entic Haplorthods, sandy, fine-loamy banded substratum, complex, nearly level and undulating

Setting

Landform: Moraines
Slope range: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 47 acres

Reference Profile

Alfic Haplorthods

Organic mat:
0 to 2 inches—partially decomposed hardwood leaf litter

Surface layer:
2 to 4 inches—very dark gray sand

Subsurface layer:
4 to 7 inches—grayish brown sand

Subsoil:
7 to 11 inches—dark brown, very friable loamy sand
11 to 32 inches—strong brown, loose sand
32 to 37 inches—yellowish brown, loose sand
37 to 42 inches—dark brown, very friable sandy loam

Substratum:
42 to 77 inches—reddish yellow sand
77 to 180 inches—brownish yellow sand

Entic Haplorthods

Surface layer:
0 to 2 inches—dark grayish brown sand

Subsurface layer:
2 to 3 inches—pale brown sand

Subsoil:
3 to 6 inches—dark brown, very friable sand
6 to 15 inches—strong brown, loose sand
15 to 30 inches—yellowish brown, loose sand
30 to 55 inches—light yellowish brown, loose sand

Substratum:
55 to 70 inches—yellowish brown sand with bands of sandy clay loam
70 to 95 inches—light yellowish brown, stratified sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Alfic Haplorthods—well drained; Entic Haplorthods—excessively drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Alfic Haplorthods—moderate; Entic Haplorthods—severe
Potential for frost action: Low

Composition

Alfic Haplorthods and similar soils: 40 to 80 percent
Entic Haplorthods and similar soils: 20 to 50 percent
Contrasting inclusions: 5 to 20 percent

Inclusions

Contrasting inclusions:
• The very poorly drained Leafriver and Wakeley soils and euic Borosaprists; in depressions and drainageways

Similar inclusions:
• Sandy soils that have a fine-loamy substratum

Use and Management

Land use: Woodland
Major management concerns: Alfic Haplorthods—seedling mortality, seasonal droughtiness, plant competition; Entic Haplorthods—equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.
• Carefully managed reforestation helps to control undesirable understory plants.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary plant association: Northern red oak-Red maple-Mapleleaf viburnum
Secondary plant association: Mixed oak-Red maple-Starflower

233C—Alfic Haplorthods, sandy-Entic Haplorthods, sandy, fine-loamy banded substratum, complex, rolling

Setting

Landform: Moraines
Slope range: 6 to 18 percent
Shape of areas: Irregular
Size of areas: 25 acres

Reference Profile

Alfic Haplorthods

Organic mat:
0 to 2 inches—partially decomposed hardwood leaf litter

Surface layer:
2 to 4 inches—very dark gray sand

Subsurface layer:
4 to 7 inches—grayish brown sand

Subsoil:
7 to 11 inches—dark brown, very friable loamy sand
11 to 32 inches—strong brown, loose sand
32 to 37 inches—yellowish brown, loose sand
37 to 42 inches—dark brown, very friable sandy loam

Substratum:
42 to 77 inches—reddish yellow sand
77 to 180 inches—brownish yellow sand

Entic Haplorthods

Surface layer:
0 to 2 inches—dark grayish brown sand

Subsurface layer:
2 to 3 inches—pale brown sand

Subsoil:
3 to 6 inches—dark brown, very friable sand
6 to 15 inches—strong brown, loose sand
15 to 30 inches—yellowish brown, loose sand
30 to 55 inches—light yellowish brown, loose sand

Substratum:
55 to 70 inches—yellowish brown sand with bands of sandy clay loam
70 to 95 inches—light yellowish brown, stratified sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Alfic Haplorthods—well drained; Entic Haplorthods—excessively drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Alfic Haplorthods—moderate; Entic Haplorthods—severe
Potential for frost action: Low

Composition

Alfic Haplorthods and similar soils: 40 to 80 percent
Entic Haplorthods and similar soils: 20 to 50 percent
Contrasting inclusions: 5 to 20 percent

Inclusions

Contrasting inclusions:
- The very poorly drained Leafriver and Wakeley soils and euic Borosaprists; in depressions and drainageways

Similar inclusions:
- Sandy soils that have a fine-loamy substratum
- Sandy soils that do not have a dark brown subsoil

Use and Management

Land use: Woodland
Major management concerns: Alfic Haplorthods—equipment limitations, seedling mortality, seasonal droughtiness, plant competition, erosion hazard, slope; Entic Haplorthods—equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
- Because loose sand and the slope can hinder the traction of wheeled equipment, skid roads should be built on the contour or on the gentler slopes.
- Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.
- Areas with a southern exposure may have a higher seedling mortality rate than other areas.
- Carefully managed reforestation helps to control undesirable understory plants.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary plant association: Northern red oak-Red maple-Mapleleaf viburnum

Secondary plant association: Mixed oak-Red maple-Starflower

233D—Alfic Haplorthods, sandy-Entic Haplorthods, sandy, fine-loamy banded substratum, complex, hilly

Setting

Landform: Sandy moraines
Slope range: 18 to 30 percent
Shape of areas: Linear
Size of areas: 46 acres

Reference Profile

Alfic Haplorthods

Organic mat:
0 to 2 inches—partially decomposed hardwood leaf litter

Surface layer:
2 to 4 inches—very dark gray sand

Subsurface layer:
4 to 7 inches—grayish brown sand

Subsoil:
7 to 11 inches—dark brown, very friable loamy sand
11 to 32 inches—strong brown, loose sand
32 to 37 inches—yellowish brown, loose sand
37 to 42 inches—dark brown, very friable sandy loam

Substratum:
42 to 77 inches—reddish yellow sand
77 to 180 inches—brownish yellow sand

Entic Haplorthods

Surface layer:
0 to 2 inches—dark grayish brown sand

Subsurface layer:
2 to 3 inches—pale brown sand

Subsoil:
3 to 6 inches—dark brown, very friable sand
6 to 15 inches—strong brown, loose sand
15 to 30 inches—yellowish brown, loose sand
30 to 55 inches—light yellowish brown, loose sand

Substratum:
55 to 70 inches—yellowish brown sand with bands of sandy clay loam
70 to 95 inches—light yellowish brown, stratified sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Alfic Haplorthods—well drained; Entic Haplorthods—excessively drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Rapid
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Alfic Haplorthods—moderate; Entic Haplorthods—severe
Potential for frost action: Low

Composition

Alfic Haplorthods and similar soils: 40 to 80 percent
Entic Haplorthods and similar soils: 20 to 50 percent
Contrasting inclusions: 5 to 20 percent

Inclusions

Contrasting inclusions:
- The very poorly drained Leafriver and Wakeley soils and euic Borosaprists; in depressions and drainageways

Similar inclusions:
- Sandy soils that have a fine-loamy substratum
- Sandy soils that do not have a dark brown subsoil

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, erosion hazard, seasonal droughtiness, and slope in areas of both soils; plant competition an additional concern in areas of the Alfic Haplorthods
Management considerations:
- Because loose sand and the slope can hinder the traction of wheeled equipment, skid roads should be built on the contour or on the gentler slopes.
- Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
- The grade should be kept as low as possible.
- Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.
- Areas with a southern exposure may have a higher seedling mortality rate than other areas.
- Carefully managed reforestation helps to control undesirable understory plants.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned

Primary plant association: Northern red oak-Red maple-Mapleleaf viburnum
Secondary plant association: Mixed oak-Red maple-Starflower

235B—Alfic Haplorthods, sandy over loamy-Alfic Haplorthods, sandy, complex, nearly level and undulating

Setting

Landform: Moraines
Slope range: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 20 to 200 acres

Reference Profile

Alfic Haplorthods, sandy over loamy

Organic mat:
0 to 2 inches—black, partially decomposed hardwood leaf litter

Surface layer:
2 to 4 inches—very dark grayish brown sand

Subsurface layer:
4 to 6 inches—grayish brown sand

Subsoil:
6 to 9 inches—dark brown, very friable loamy sand
9 to 27 inches—strong brown, loose sand
27 to 44 inches—brown, firm sandy clay loam

Substratum:
44 to 52 inches—yellowish brown loamy sand
52 to 120 inches—brownish yellow sand

Alfic Haplorthods, sandy

Organic mat:
0 to 2 inches—partially decomposed hardwood leaf litter

Surface layer:
2 to 4 inches—very dark gray sand

Subsurface layer:
4 to 7 inches—grayish brown sand

Subsoil:
7 to 11 inches—dark brown, friable loamy sand
11 to 32 inches—strong brown, very friable sand
32 to 37 inches—yellowish brown, loose sand
37 to 42 inches—dark brown, very friable sandy loam

Substratum:
42 to 77 inches—reddish yellow sand
77 to 180 inches—brownish yellow sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Alfic Haplorthods, sandy over loamy—severe; Alfic Haplorthods, sandy—moderate
Potential for frost action: Low

Composition

Alfic Haplorthods, sandy over loamy, and similar soils: 40 to 70 percent
Alfic Haplorthods, sandy, and similar soils: 20 to 50 percent
Contrasting inclusions: 5 to 20 percent

Inclusions

Contrasting inclusions:
• The very poorly drained Leafriver and Wakeley soils and euic Borosaprists; in depressions and drainageways
• Eutroboralfs in landscape positions similar to those of the major soils

Similar inclusions:
• Sandy soils that do not have a dark brown subsoil
• Sandy soils that do not have loamy textures in the profile

Use and Management

Land use: Woodland
Major management concerns: Plant competition in areas of both soils; equipment limitations, seedling mortality, and seasonal droughtiness additional limitations in areas of the Alfic Haplorthods, sandy over loamy
Management considerations:
• Special harvest methods may be needed to control undesirable plants.
• Carefully managed reforestation helps to control undesirable understory plants.
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary plant association: Northern red oak-Red maple-Mapleleaf viburnum
Secondary plant association: Northern red oak-Red maple-Trefoil

235C—Alfic Haplorthods, sandy over loamy-Alfic Haplorthods, sandy, complex, rolling

Setting

Landform: Moraines
Slope range: 6 to 18 percent
Shape of areas: Irregular
Size of areas: 20 to 100 acres

Reference Profile

Alfic Haplorthods, sandy over loamy

Organic mat:
0 to 2 inches—black, partially decomposed hardwood leaf litter

Surface layer:
2 to 4 inches—very dark grayish brown sand

Subsurface layer:
4 to 6 inches—grayish brown sand

Subsoil:
6 to 9 inches—dark brown, very friable loamy sand
9 to 27 inches—strong brown, friable sand
27 to 44 inches—brown, firm sandy clay loam

Substratum:
44 to 52 inches—yellowish brown loamy sand
52 to 120 inches—brownish yellow sand

Alfic Haplorthods, sandy

Organic mat:
0 to 2 inches—partially decomposed hardwood leaf litter

Surface layer:
2 to 4 inches—very dark gray sand

Subsurface layer:
4 to 7 inches—grayish brown sand

Subsoil:
7 to 11 inches—dark brown, friable loamy sand
11 to 32 inches—strong brown, very friable sand
32 to 37 inches—yellowish brown, loose sand
37 to 42 inches—dark brown, very friable sandy loam

Substratum:
42 to 77 inches—reddish yellow sand
77 to 180 inches—brownish yellow sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 15 feet
Surface runoff: Slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Alfic Haplorthods, sandy over loamy—severe; Alfic Haplorthods, sandy—moderate
Potential for frost action: Low

Composition

Alfic Haplorthods, sandy over loamy, and similar soils: 40 to 70 percent
Alfic Haplorthods, sandy, and similar soils: 20 to 50 percent
Contrasting inclusions: 5 to 20 percent

Inclusions

Contrasting inclusions:
- The very poorly drained Leafriver and Wakeley soils and euic Borosaprists; in depressions and drainageways
- Eutroboralfs in landscape positions similar to those of the major soils

Similar inclusions:
- Sandy soils that do not have a dark brown subsoil
- Sandy soils that have a water table at a depth of 6 to 9 feet
- Sandy soils that do not have loamy textures in the profile

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, erosion hazard, slope, plant competition
Management considerations:
- Because loose sand and the slope can hinder the traction of wheeled equipment, skid roads should be built on the contour or on the gentler slopes.
- Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate.
- Areas with a southern exposure may have a higher seedling mortality rate than other areas.

• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary plant association: Northern red oak-Red maple-Mapleleaf viburnum
Secondary plant association: Northern red oak-Red maple-Trefoil

236B—Arenic Eutroboralfs, loamy, nearly level and undulating

Setting

Landform: Moraines
Slope range: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 10 to 50 acres

Reference Profile

Surface layer:
0 to 2 inches—very dark gray loamy sand

Subsurface layer:
2 to 4 inches—light brownish gray sand

Subsoil:
4 to 10 inches—dark yellowish brown, friable sand
10 to 30 inches—yellowish brown, friable loamy sand
30 to 35 inches—strong brown, friable sandy loam

Substratum:
35 to 45 inches—dark brown sandy clay loam
45 to 70 inches—yellowish brown loamy sand
70 to 100 inches—light yellowish brown, stratified sand

Soil Properties and Qualities

Permeability: Rapid over moderate
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Potential for frost action: Moderate

Composition

Arenic Eutroboralfs and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Allendale soils
• The very poorly drained, euic Borosaprists in depressions and drainageways

Similar inclusions:
• Soils that are moderately well drained
• Soils that have a loamy surface layer
• Soils that have a dark brown subsoil

Use and Management

Land use: Woodland
Major management concerns: Plant competition
Management considerations:
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary plant association: Northern red oak-Red maple-Mapleleaf viburnum
Secondary plant association: Northern red oak-Red maple-Trefoil

237B—Eutroboralfs, nearly level and undulating

Setting

Landform: Moraines
Slope range: 0 to 6 percent
Shape of areas: Irregular
Size of areas: 10 to 50 acres

Reference Profile

Surface layer:
0 to 3 inches—very dark gray sandy loam

Subsoil:
3 to 12 inches—brown and dark brown, friable loamy sand
12 to 29 inches—reddish brown, firm sandy clay loam and brown, friable sandy loam
29 to 43 inches—brown, friable loamy sand

Substratum:
43 to 58 inches—reddish brown loamy sand
58 to 84 inches—stratified reddish brown and yellowish brown loam

Soil Properties and Qualities

Permeability: Moderate
Available water capacity: Moderate
Drainage class: Well drained and moderately well drained
Seasonal high water table: Apparent, at a depth of 3.5 to 6.0 feet at some time from October through May
Surface runoff: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Potential for frost action: Moderate

Composition

Eutroboralfs and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The excessively drained, sandy Entic Haplorthods in landscape positions similar to those of the major soils
• The somewhat poorly drained Allendale soils
• The poorly drained Typic Endoaquods
• The very poorly drained, euic Borosaprists in depressions and drainageways

Similar inclusions:
• Soils that have a dark subsoil
• Soils that have a surface layer of loamy sand or fine sand

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, plant competition
Management considerations:
• Because of low strength, suitable surfacing material is needed on year-round logging roads and landings.
• Skidders should not be used during wet periods, when ruts form easily.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary plant association: Northern red oak-Red maple-Trefoil
Secondary plant association: Northern red oak-Red maple-Mapleleaf viburnum

237D—Eutroboralfs, hilly

Setting

Landform: Moraines
Slope range: 18 to 30 percent
Shape of areas: Irregular
Size of areas: 10 to 20 acres

Reference Profile

Surface layer:
0 to 3 inches—very dark gray sandy loam

Subsoil:
3 to 12 inches—brown and dark brown, friable loamy sand
12 to 29 inches—reddish brown, friable sandy clay loam and brown, friable sandy loam
29 to 43 inches—brown, friable loamy sand

Substratum:
43 to 58 inches—reddish brown loamy sand
58 to 84 inches—stratified reddish brown and yellowish brown loam

Soil Properties and Qualities

Permeability: Moderate
Available water capacity: Moderate
Drainage class: Well drained and moderately well drained
Seasonal high water table: Apparent, at a depth of 3.5 to 6.0 feet at some time from October through May
Surface runoff: Rapid
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Moderate
Potential for frost action: Moderate

Composition

Eutroboralfs and similar soils: 70 to 90 percent
Contrasting inclusions: 10 to 30 percent

Inclusions

Contrasting inclusions:
• The excessively drained, sandy Entic Haplorthods in landscape positions similar to those of the major soils
• The somewhat poorly drained Allendale soils
• The poorly drained Typic Endoaquods
• The very poorly drained, euic Borosaprists in depressions and drainageways

Similar inclusions:
• Soils that have a dark subsoil
• Soils that have a surface layer of loamy sand or fine sand

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, erosion hazard, slope, plant competition
Management considerations:
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• The grade should be kept as low as possible.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• The hazard of erosion can be reduced by seeding logging roads, landings, and areas that have been cut and filled and by installing water bars and culverts.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary plant association: Northern red oak-Red maple-Trefoil
Secondary plant association: Northern red oak-Red maple-Mapleleaf viburnum

254A—Borosaprists, euic-Fluvaquents-Aquic Udipsamments complex, nearly level

Setting

Landform: Outwash plains and flood plains
Slope range: 0 to 2 percent
Shape of areas: Irregular or linear
Size of areas: 10 to 600 acres

Reference Profile

Borosaprists

Surface layer:
0 to 9 inches—black muck

Subsoil:
9 to 15 inches—dark reddish brown, very friable muck
15 to 20 inches—black, very friable muck
20 to 60 inches—gray, loose sand and loamy sand

Fluvaquents

Surface layer:
0 to 3 inches—black muck
3 to 8 inches—very dark gray, mottled loamy sand

Subsurface layer:
8 to 15 inches—brown, mottled loamy sand
15 to 38 inches—yellowish brown, mottled sand

Subsoil:
38 to 80 inches—pale brown, friable, mottled sand with thin layers of silt, silty clay, and clay

Aquic Udipsamments

Surface layer:
0 to 6 inches—black sand

Subsoil:
6 to 22 inches—dark yellowish brown, friable sand

Substratum:
22 to 45 inches—yellowish brown sand
45 to 80 inches—brownish yellow sand

Soil Properties and Qualities

Permeability: Borosaprists—moderately slow to moderately rapid; Fluvaquents and Aquic Udipsamments—rapid
Available water capacity: Borosaprists—high; Fluvaquents—moderate; Aquic Udipsamments—low
Drainage class: Borosaprists and Fluvaquents—very poorly drained; Aquic Udipsamments—somewhat poorly drained
Seasonal high water table: Borosaprists—apparent, 1 foot above to 1 foot below the surface from September through June; Fluvaquents—apparent, 1 foot above to 1 foot below the surface from October through May; Aquic Udipsamments—apparent, at a depth of 0.5 foot to 1.5 feet from October through May
Surface runoff: Borosaprists—very slow or ponded; Fluvaquents and Aquic Udipsamments—very slow
Flooding: Common
Hazard of water erosion: Slight
Hazard of soil blowing: Borosaprists and Fluvaquents—moderate; Aquic Udipsamments—severe
Potential for frost action: Borosaprists and Fluvaquents—high; Aquic Udipsamments—moderate

Composition

Borosaprists and similar soils: 30 to 50 percent
Fluvaquents and similar soils: 30 to 50 percent
Aquic Udipsamments and similar soils: 10 to 20 percent
Contrasting inclusions: 0 to 20 percent

Inclusions

Contrasting inclusions:
- The excessively drained, sandy Entic Haplorthods on uplands

Similar inclusions:
- Sandy soils that have a fine textured substratum
- Organic soils that are acid

Use and Management

Land use: Woodland
Major management concerns: Borosaprists and Fluvaquents—equipment limitations, seedling mortality, plant competition, windthrow hazard; Aquic Udipsamments—equipment limitations, seedling mortality, plant competition, seasonal wetness, seasonal droughtiness
Management considerations:
- The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
- Carefully managed reforestation helps to control undesirable understory plants.
- Planting when the soil is moist can reduce the seedling mortality rate.
- Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- Trees that can withstand seasonal wetness should be selected for planting.
- Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings are beneficial for natural regeneration.
- Because of wetness and low strength, harvesting is not recommended.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary plant association: None assigned
Secondary plant association: None assigned

262A—Au Gres sand, nearly level

Setting

Landform: Outwash plains and sandy lake plains
Slope range: 0 to 3 percent
Shape of areas: Irregular
Size of areas: 20 to 300 acres

Typical Profile

Surface layer:
0 to 3 inches—black sand

Subsurface layer:
3 to 10 inches—pinkish gray sand

Subsoil:
10 to 14 inches—dark brown, mottled, loose sand
14 to 27 inches—dark yellowish brown, mottled, loose sand
27 to 33 inches—yellowish brown, mottled, loose sand

Substratum:
33 to 80 inches—pale brown, mottled sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, at a depth of 0.5 foot to 1.5 feet at some time from October through May
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Potential for frost action: Moderate

Composition

Au Gres and similar soils: 70 to 80 percent
Contrasting inclusions: 20 to 30 percent

Inclusions

Contrasting inclusions:
- The excessively drained, sandy Entic Haplorthods on knolls
- The very poorly drained, dysic Borosaprists in depressions

Similar inclusions:
- Sandy soils that have a fine textured substratum
- Soils that have an accumulation of organic matter in the surface layer
- Soils that have a cemented subsoil

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition, seasonal wetness
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Skidders should not be used during wet periods, when ruts form easily.
• Trees that can withstand seasonal wetness should be selected for planting.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.

Interpretive Groups

Land capability classification: IVw
Woodland ordination symbol: 6W
Michigan soil management group: 5b
Primary plant association: Northern red oak-Red maple-Leatherleaf-Blueberry
Secondary plant association: Red maple-Balsam fir-Bunchberry

263A—Argic Endoaquods, nearly level

Setting

Landform: Outwash plains and lake plains
Slope range: 0 to 3 percent
Shape of areas: Irregular
Size of areas: 20 to 100 acres

Reference Profile

Surface layer:
0 to 2 inches—black, partially decomposed leaf litter
2 to 5 inches—very dark gray sand

Subsurface layer:
5 to 10 inches—light brownish gray sand

Subsoil:
10 to 22 inches—strong brown, friable sand
22 to 37 inches—strong brown, friable loamy sand

Substratum:
37 to 80 inches—yellowish brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, at a depth of 0.5 foot to 1.5 feet at some time from October through May
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Potential for frost action: Moderate

Composition

Argic Endoaquods and similar soils: 70 to 80 percent
Contrasting inclusions: 20 to 30 percent

Inclusions

Contrasting inclusions:
• The excessively drained, sandy Entic Haplorthods on knolls
• The very poorly drained, dysic Borosaprists in depressions

Similar inclusions:
• Sandy soils that have a fine textured substratum
• Soils that have an accumulation of organic matter in the surface layer
• Soils that have a cemented subsoil

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition, seasonal wetness
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Skidders should not be used during wet periods, when ruts form easily.
• Trees that can withstand seasonal wetness should be selected for planting.
• Planting special nursery stock or containerized seedlings can reduce the seedling mortality rate.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary plant association: Red maple-Balsam fir-Bunchberry
Secondary plant association: Northern red oak-Red maple-Leatherleaf-Blueberry

264A—Allendale loamy sand, nearly level

Setting

Landform: Outwash plains and lake plains
Slope range: 0 to 3 percent
Shape of areas: Irregular
Size of areas: 20 to 40 acres

Typical Profile

Surface layer:
0 to 11 inches—very dark grayish brown loamy sand

Subsurface layer:
11 to 13 inches—pale brown, mottled sand

Subsoil:
13 to 20 inches—dark brown, mottled, very friable sand
20 to 22 inches—yellowish brown, mottled, loose sand
22 to 25 inches—reddish brown, mottled, friable sandy loam

Substratum:
25 to 80 inches—reddish brown, mottled, firm silty clay

Soil Properties and Qualities

Permeability: Rapid in the sandy part and very slow in the clayey part
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched at a depth of 0.5 foot to 1.5 feet at some time from October through May
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Potential for frost action: Moderate

Composition

Allendale soil and similar soils: 70 to 80 percent
Contrasting inclusions: 20 to 30 percent

Inclusions

Contrasting inclusions:
• The excessively drained, sandy Entic Haplorthods on knolls
• The very poorly drained, dysic Borosaprists in depressions

Similar inclusions:
• Sandy soils that do not a have fine textured substratum
• Soils that have an accumulation of organic matter in the surface layer

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition, seasonal wetness
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• Trees that can withstand seasonal wetness should be selected for planting.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Carefully managed reforestation helps to control undesirable understory plants.
• If trees are planted, site preparation by mechanical or chemical means is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 4W
Michigan soil management group: 4/1b
Primary plant association: Mixed ash-Basswood-Downy yellow violet
Secondary plant association: Red maple-Balsam fir-Bunchberry

265B—Eutroboralfs-Allendale complex, nearly level and undulating

Setting

Landform: Till plains and moraines
Slope range: Eutroboralfs—0 to 6 percent; Allendale—0 to 3 percent
Shape of areas: Irregular
Size of areas: 337 acres

Typical Profile

Eutroboralfs

Surface layer:
0 to 3 inches—very dark gray sandy loam

Subsoil:
3 to 12 inches—brown and dark brown, friable loamy sand
12 to 29 inches—reddish brown, friable sandy clay loam and brown, friable sandy loam
29 to 43 inches—brown, very friable loamy sand

Substratum:
43 to 58 inches—reddish brown loamy sand
58 to 84 inches—stratified reddish brown and yellowish brown loam

Allendale

Surface layer:
0 to 11 inches—very dark grayish brown loamy sand

Subsurface layer:
11 to 13 inches—pale brown, mottled sand

Subsoil:
13 to 20 inches—dark brown, mottled, very friable sand
20 to 22 inches—yellowish brown, mottled, loose sand
22 to 25 inches—reddish brown, mottled, friable sandy loam

Substratum:
25 to 80 inches—reddish brown, mottled, firm silty clay

Soil Properties and Qualities

Permeability: Eutroboralfs—moderate; Allendale—rapid in the sandy part and very slow in the clayey part
Available water capacity: Moderate
Drainage class: Eutroboralfs—well drained and moderately well drained; Allendale—somewhat poorly drained
Seasonal high water table: Eutroboralfs—apparent, at a depth of 3.5 to 6.0 feet at some time from October through May; Allendale—perched at a depth of 0.5 foot to 1.5 feet at some time from October through May
Surface runoff: Eutroboralfs—medium; Allendale—very slow
Flooding: None
Hazard of water erosion: Eutroboralfs—moderate; Allendale—slight
Hazard of soil blowing: Moderate
Potential for frost action: Moderate

Composition

Eutroboralfs and similar soils: 60 to 80 percent
Allendale soil and similar soils: 10 to 40 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
• The excessively drained, sandy Entic Haplorthods on knolls
• The very poorly drained, euic Borosaprists in depressions and drainageways

Similar inclusions:
• Areas of the Allendale soil that do not have a fine textured substratum
• Areas of the Allendale soil that have a dark subsoil
• Areas of the Allendale soil that have a surface layer of loamy sand or fine sand

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations and plant competition in areas of both soils; seedling mortality, windthrow hazard, and seasonal wetness additional concerns in areas of the Allendale soil
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Skidders should not be used during wet periods, when ruts form easily.
• Trees that can withstand seasonal wetness should be selected for planting.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Special harvest methods may be needed to control undesirable plants.
• Carefully managed reforestation helps to control undesirable understory plants.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: Eutroboralfs—none assigned; Allendale—4W
Michigan soil management group: Eutroboralfs—none assigned; Allendale—4/1b

Primary plant association: Northern red oak-Red maple-Trefoil
Secondary plant association: Red maple-Balsam fir-Bunchberry

266A—Typic Duraquods, sandy, nearly level

Setting

Landform: Lake plains and outwash plains
Slope range: 0 to 3 percent
Shape of areas: Irregular or linear
Size of areas: 50 to 1,000 acres

Typical Profile

Surface layer:
0 to 3 inches—black, partially decomposed leaf litter

Subsurface layer:
3 to 6 inches—gray, mottled sand
6 to 12 inches—light brownish gray, mottled sand

Subsoil:
12 to 13 inches—dark reddish brown, strongly cemented, very firm sand
13 to 21 inches—dark reddish brown and black, strongly cemented, very firm sand
21 to 28 inches—yellowish brown, loose, mottled sand

Substratum:
28 to 36 inches—yellowish brown, mottled sand
36 to 80 inches—brown sand

Soil Properties and Qualities

Permeability: Moderately rapid
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, at a depth of 0.5 foot to 1.5 feet at some time from October through May
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Potential for frost action: Moderate

Composition

Typic Duraquods and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Croswell soils on ridges
• The very poorly drained, euic Borosaprists in small depressions and drainageways

Similar inclusions:
• Soils that have a lighter colored subsoil
• Soils that do not have a cemented subsoil
• Soils that have clay material below a depth of 40 inches

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, plant competition, seedling mortality, windthrow hazard, seasonal wetness
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Trees that can withstand seasonal wetness should be selected for planting.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Planting when the soil is moist can reduce the seedling mortality rate.
• If trees are planted, site preparation by mechanical or chemical means is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.
• Planting when the soil is moist can reduce the seedling mortality rate.

Interpretive Groups

Land capability classification: IVw
Woodland ordination symbol: 4W
Michigan soil management group: 5b-h
Primary plant association: Northern red oak-Red maple-Leatherleaf-Blueberry
Secondary plant association: Red maple-Balsam fir-Bunchberry

272—Endoaquods-Fluvaquents complex

Setting

Landform: Outwash plains, deltas, and flood plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 20 to 200 acres

Reference Profile

Endoaquods

Surface layer:
0 to 2 inches—black sand

Subsurface layer:
2 to 8 inches—dark grayish brown, mottled sand

Subsoil:
8 to 19 inches—dark brown and dark yellowish brown, mottled, very friable sand

Substratum:
19 to 48 inches—yellowish brown, mottled loamy sand
48 to 80 inches—olive brown sand

Fluvaquents

Surface layer:
0 to 3 inches—black muck
3 to 8 inches—very dark gray, mottled loamy sand

Subsurface layer:
8 to 15 inches—brown, mottled loamy sand
15 to 38 inches—yellowish brown, mottled sand

Subsoil:
38 to 80 inches—pale brown, mottled, friable sand with thin layers of silt, silty clay, and clay

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Endoaquods—low; Fluvaquents—moderate
Drainage class: Very poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface from October through May
Surface runoff: Very slow or ponded
Flooding: Endoaquods—none; Fluvaquents—common
Hazard of water erosion: Slight
Hazard of soil blowing: Endoaquods—severe; Fluvaquents—moderate
Potential for frost action: Endoaquods—moderate; Fluvaquents—high

Composition

Endoaquods and similar soils: 40 to 60 percent
Fluvaquents and similar soils: 40 to 60 percent
Contrasting inclusions: 20 to 35 percent

Inclusions

Contrasting inclusions:
• The excessively drained, sandy Entic Haplorthods on knolls
• The very poorly drained, euic Borosaprists in depressions
• The very poorly drained, dysic Borosaprists in depressions

Similar inclusions:
• Sandy soils that have a fine textured substratum
• Soils that have more accumulation of organic matter in the surface layer
• Soils that have finer textured surface horizons
• Soils that have a cemented subsoil

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, windthrow hazard, seedling mortality, plant competition, seasonal wetness
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Skidders should not be used during wet periods, when ruts form easily.
• Trees that can withstand seasonal wetness should be selected for planting.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting when the soil is moist can reduce the seedling mortality rate.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary plant association: Northern red oak-Red maple-Leatherleaf-Blueberry
Secondary plant association: Red maple-Balsam fir-Bunchberry

273—Leafriver-Wakeley complex

Setting

Landform: Outwash plains and lake plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 20 to 200 acres

Typical Profile

Leafriver

Surface layer:
0 to 9 inches—black muck

Substratum:
9 to 21 inches—brown and dark brownish gray sand
21 to 27 inches—grayish brown, mottled sand
27 to 80 inches—dark grayish brown sand

Wakeley

Surface layer:
0 to 6 inches—black, mottled mucky sand

Substratum:
6 to 12 inches—gray sand
12 to 24 inches—grayish brown, mottled sand
24 to 29 inches—grayish brown, mottled, stratified sand and loamy sand
29 to 34 inches—pinkish gray, mottled clay
34 to 80 inches—pinkish gray, mottled, stratified clay and silty clay

Soil Properties and Qualities

Permeability: Leafriver—rapid; Wakeley—rapid in the sandy part and very slow in the clayey part
Available water capacity: Moderate
Drainage class: Very poorly drained
Seasonal high water table: Leafriver—apparent, 1 foot above to 1 foot below the surface from November through July; Wakeley—perched 1 foot above to 1 foot below the surface from October through May
Surface runoff: Very slow or ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Leafriver—moderate; Wakeley—severe
Potential for frost action: Leafriver—high; Wakeley—moderate

Composition

Leafriver and similar soils: 40 to 60 percent
Wakeley and similar soils: 40 to 60 percent
Contrasting inclusions: 10 to 20 percent

Inclusions

Contrasting inclusions:
- The moderately well drained, sandy Entic Haplorthods on knolls
- The very poorly drained, dysic Borosaprists in depressions

Similar inclusions:
- Sandy soils that have fine textured surface horizons
- Soils that have a thick accumulation of organic matter

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, windthrow hazard, seedling mortality, plant competition, seasonal wetness
Management considerations:
- The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
- Skidders should not be used during wet periods, when ruts form easily.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
- Carefully managed reforestation helps to control undesirable understory plants.
- Special harvest methods may be needed to control undesirable plants.
- Because of the wetness and low strength, harvesting is not recommended in areas of organic soils.

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: Leafriver—2W; Wakeley—3W
Michigan soil management group: Leafriver—5c; Wakeley—4/1c
Primary plant association: Red maple-Balsam fir-Bunchberry
Secondary plant association: Northern red oak-Red maple-Leatherleaf-Blueberry

274—Typic Endoaquods

Setting

Landform: Outwash plains and lake plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Reference Profile

Surface layer:
0 to 2 inches—black mucky sand

Subsurface layer:
2 to 5 inches—grayish brown, mottled sand

Subsoil:
5 to 8 inches—dark brown, mottled, friable sand
8 to 15 inches—strong brown, mottled, very friable sand

Substratum:
15 to 80 inches—brown, mottled sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Very poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from October through May
Surface runoff: Very slow or ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Potential for frost action: Moderate

Composition

Typic Endoaquods and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained, sandy Entic Haplorthods on knolls
• The very poorly drained, dysic Borosaprists in depressions

Similar inclusions:
• Poorly drained soils that have sandy textures

Use and Management

Land use: Woodland
Major management concerns: Equipment limitations, windthrow hazard, seedling mortality, plant competition, seasonal wetness
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Skidders should not be used during wet periods, when ruts form easily.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Trees that can withstand seasonal wetness should be selected for planting.
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting when the soil is moist can reduce the seedling mortality rate.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary plant association: Mixed ash-Basswood-Downy yellow violet
Secondary plant association: Northern whitecedar-Eastern hemlock-Canada violet

280—Aquents and Histosols, ponded

Setting

Landform: Outwash plains and flood plains
Slope range: 0 to 1 percent
Shape of areas: Oval or irregular
Size of areas: 5 to 100 acres

Reference Profile

Aquents

0 to 80 inches—variable

Histosols

0 to 60 inches—black muck
60 to 80 inches—gray sand

Soil Properties and Qualities

Permeability: Moderately rapid to moderately slow
Available water capacity: Aquents—low; Histosols—high
Drainage class: Very poorly drained
Seasonal high water table: Apparent, at the surface to 1 foot above the surface from January through December
Surface runoff: Ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Aquents—none assigned; Histosols—moderate
Potential for frost action: High

Composition

Aquents: 50 to 70 percent

Histosols: 30 to 40 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
• Small areas of somewhat poorly drained soils at the edges of the unit
• Small areas of open water

Use and Management

Land use: Wetland wildlife habitat
Major management concerns: Onsite investigation is needed to determine the suitability for specific uses.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary plant association: None assigned
Secondary plant association: None assigned

281—Borosaprists, dysic

Setting

Landform: Shallow closed depressions on outwash and lake plains and flood plains
Slope range: 0 to 2 percent
Shape of areas: Oval
Size of areas: 5 to 100 acres

Reference Profile

Surface layer:
0 to 13 inches—dark reddish brown mucky peat

Subsoil:
13 to 25 inches—black, friable muck

Substratum:
25 to 80 inches—dark grayish brown and yellowish brown sand

Soil Properties and Qualities

Permeability: Moderately slow to moderately rapid in the mucky part and rapid in the sandy part
Available water capacity: High
Drainage class: Very poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from September through June
Surface runoff: Very slow or ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Potential for frost action: High

Composition

Borosaprists: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
• Poorly drained, sandy soils on knolls and ridges

Similar inclusions:
• Soils that have less than 16 inches of organic material

Use and Management

Land use: Woodland
Major management concerns: Wetness
Management considerations:
• Because of wetness and low strength, management of this unit is not recommended.

Interpretive Groups

Land capability classification: VIIw
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary plant association: Black spruce-Tamarack-Labrador tea
Secondary plant association: None assigned

282—Borosaprists, euic

Setting

Landform: Depressions on moraines, till plains, and alluvial plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 20 to 200 acres

Reference Profile

Surface layer:
0 to 9 inches—black muck

Subsoil:
9 to 38 inches—dark reddish brown muck
38 to 51 inches—black muck

Soil Properties and Qualities

Permeability: Moderately slow to moderately rapid
Available water capacity: High
Drainage class: Very poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from September through June
Surface runoff: Very slow or ponded
Flooding: None

Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Potential for frost action: High

Composition

Borosaprists: 90 to 100 percent
Contrasting inclusions: 0 to 10 percent

Inclusions

Contrasting inclusions:
• Dysic Borosaprists in landscape positions similar to those of the major soils
• The somewhat poorly drained Au Gres soils on knolls and ridges

Similar inclusions:
• Soils that have sandy material below a depth of 16 inches
• Soils that have loamy or clayey material below a depth of 16 inches
• Soils that have a higher fiber content in the subsoil

Use and Management

Land use: Woodland
Major management concerns: Wetness
Management considerations:
• Because of wetness and low strength, management of this unit is not recommended.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned
Primary plant association: Northern whitecedar-Eastern hemlock-Canada violet
Secondary plant association: Mixed ash-Basswood-Downy yellow violet

343—Sims loam, drained

Setting

Landform: Till plains and moraines
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Surface layer:
0 to 5 inches—black loam

Subsoil:
5 to 47 inches—dark gray and gray, mottled, firm clay loam

Substratum:
47 to 80 inches—light reddish brown, mottled clay loam

Soil Properties and Qualities

Permeability: Slow
Available water capacity: High
Drainage class: Poorly drained
Seasonal high water table: Perched 1 foot above to 1 foot below the surface at some time from October through May
Surface runoff: Very slow or ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Moderate
Potential for frost action: High

Composition

Sims soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The poorly drained, sandy over loamy Caffey soils
• The somewhat poorly drained Kawkawlin soils
• The very poorly drained Deford soils

Similar inclusions:
• Soils that have a surface layer of sandy loam
• Soils that have sand below a depth of 40 inches

Use and Management

Dominant land use: Cropland
Other uses: Pasture

Cropland

Major management concerns: Restricted permeability, soil compaction, tilth in the surface layer, seasonal wetness, ponding
Management considerations:
• Both surface and subsurface drainage systems are needed to reduce the wetness.
• Because of the restricted permeability, subsurface drains should be narrowly spaced.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.

Pasture

Major management concerns: Compaction, seasonal wetness
Management considerations:
• Proper stocking rates, a planned grazing system,

and deferred grazing during wet periods help to keep the pasture in good condition.
• Restricted grazing during wet periods helps to prevent compaction and poor tilth.

Building sites

Major management concerns: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 4W
Michigan soil management group: 1.5c

355E—Crowell-Proper complex, 4 to 25 percent slopes

Setting

Landform: Dune ridges on lake plains
Slope range: Crowell—8 to 25 percent; Proper—4 to 8 percent
Shape of areas: Linear
Size of areas: 10 to 100 acres

Typical Profile

Crowell

Surface layer:
0 to 4 inches—black sand

Subsurface layer:
4 to 8 inches—light brownish gray sand

Subsoil:
8 to 17 inches—dark brown, very friable sand
17 to 22 inches—yellowish brown, loose sand with columns of dark reddish brown, strongly cemented sand
22 to 34 inches—strong brown, loose sand with columns of dark reddish brown, strongly cemented sand
34 to 52 inches—brownish yellow, loose sand

Substratum:
52 to 80 inches—very pale brown sand

Proper

Surface layer:
0 to 2 inches—black, partially decomposed leaf litter

Subsurface layer:
2 to 12 inches—dark grayish brown and grayish brown sand

Subsoil:
12 to 19 inches—dark brown, very friable sand with columns of strongly cemented sand
19 to 26 inches—brownish yellow, loose sand with columns of weakly cemented sand
26 to 40 inches—brownish yellow, mottled, loose sand with columns of weakly cemented sand

Substratum:
40 to 80 inches—pale brown and light yellowish brown, mottled sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Crowell—somewhat excessively drained; Proper—moderately well drained
Seasonal high water table: Crowell—at a depth of more than 6 feet; Proper—apparent, at a depth of 2.0 to 3.5 feet at some time from November through May
Surface runoff: Crowell—medium or slow; Proper—slow or very slow
Flooding: None
Hazard of water erosion: Crowell—moderate; Proper—slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Crowell soil and similar soils: 40 to 50 percent
Proper soil and similar soils: 40 to 50 percent
Contrasting inclusions: 0 to 20 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained McIvor soils
• The very poorly drained Wabun soils
• The very poorly drained Kanotin soils

Similar inclusions:
• Soils that do not have a cemented subsoil
• Soils that have a darker subsoil

Use and Management

Dominant land use: Woodland

Woodland

Major management concerns: Crowell—equipment limitations, seedling mortality, seasonal droughtiness, erosion hazard, slope; Proper—equipment limitations, seedling mortality, seasonal droughtiness, plant competition, windthrow

Management considerations:
- Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- The grade should be kept as low as possible.
- Areas sensitive to erosion, esthetic considerations, and drought conditions may require mulch, such as straw, bark, or wood chips.
- Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
- In areas of the Proper soil, windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
- Carefully managed reforestation helps to control undesirable understory plants in areas of the Proper soil.
- Special harvest methods may be needed to control undesirable plants in areas of the Proper soil.

Building sites

Major management concerns: Crowell—cutbanks caving, slope; Proper—cutbanks caving, seasonal wetness

Management considerations:
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
- Because of the slope, the Crowell soil is poorly suited to building site development unless extensive land shaping is feasible.
- Wetness in areas of the Proper soil can be reduced by installing a drainage system around structures with basements and crawl spaces.
- In areas of the Proper soil, buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.

Septic tank absorption fields

Major management concerns: Crowell—rapid permeability, slope; Proper—rapid permeability, seasonal wetness

Management considerations:
- The poor filtering capacity of these soils can result in the pollution of ground water.
- Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
- Filling or mounding with suitable material helps to raise the absorption field above the water table in areas of the Proper soil.
- A subsurface drainage system helps to lower the water table in areas of the Proper soil.
- Because of the slope, the Crowell soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: Crowell—7R; Proper—5W
Michigan soil management group: 5a-h

356E—Aquepts-Histosols-Fluvaquents complex, nearly level to very steep

Setting

Landform: Narrow flood plains and adjacent steep side slopes on till plains, lake plains, and outwash plains
Slope range: Aquepts—4 to 35 percent; Histosols—0 to 2 percent; Fluvaquents—0 to 4 percent
Shape of areas: Linear
Size of areas: 20 to 500 acres

Typical Profile

Aquepts

Surface layer:
0 to 3 inches—very dark grayish brown fine sandy loam

Subsoil:
3 to 15 inches—brown, friable fine sandy loam

Substratum:
15 to 80 inches—dark reddish brown clay loam

Histosols

Surface layer:
0 to 6 inches—black muck

Subsoil:
6 to 25 inches—black, very friable muck

Substratum:
25 to 80 inches—textures ranging from sand to loam to clay

Fluvaquents

Surface layer:
0 to 6 inches—very dark gray very fine sandy loam

Subsoil:
6 to 21 inches—brown, mottled, friable sandy loam

Substratum:
21 to 42 inches—brown, mottled sandy loam
42 to 80 inches—pale brown, mottled, stratified sand and very fine sandy loam

Soil Properties and Qualities

Permeability: Aquepts—slow; Histosols—moderately slow to moderately rapid; Fluvaquents—rapid
Available water capacity: Aquepts—moderate; Histosols—high; Fluvaquents—moderate
Drainage class: Aquepts—somewhat poorly drained; Histosols—very poorly drained; Fluvaquents—poorly drained
Seasonal high water table: Aquepts—perched at a depth of 0.5 foot to 2.5 feet at some time from October through May; Histosols and Fluvaquents—apparent, 1 foot above to 1 foot below the surface at some time from October through May
Surface runoff: Aquepts—rapid; Histosols and Fluvaquents—very slow or ponded
Flooding: Aquepts and Histosols—none; Fluvaquents—common
Hazard of water erosion: Aquepts—severe; Histosols and Fluvaquents—slight
Hazard of soil blowing: Moderate
Potential for frost action: Aquepts—moderate; Histosols—high; Fluvaquents—moderate

Composition

Aquepts and similar soils: 20 to 30 percent
Histosols and similar soils: 20 to 30 percent
Fluvaquents and similar soils: 15 to 25 percent
Contrasting inclusions: 15 to 25 percent

Inclusions

Contrasting inclusions:
- The excessively drained Rubicon soils
- The well drained Curtisville soils

Similar inclusions:
- Soils that have clay in the subsoil
- Soils that have silt in the subsoil
- The somewhat poorly drained Winterfield soils

Use and Management

Dominant land use: Wildlife areas
Management considerations:
- This unit is unsuitable for most uses. Onsite investigation is needed to determine the suitability for any specific uses.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: Histosols—Mc; Aquents and Fluvaquents—none assigned

357B—Udipsamments-Urban land complex, 0 to 8 percent slopes

Setting

Landform: Outwash plains and lake terraces
Shape of areas: Irregular
Size of areas: 3,658 acres

Typical Profile

Udipsamments

Surface layer:
0 to 6 inches—black sand

Subsoil:
6 to 30 inches—yellowish brown, very friable sand
30 to 50 inches—brownish yellow, loose sand

Substratum:
50 to 80 inches—yellow sand

Soil Properties and Qualities

Udipsamments

Permeability: Rapid
Available water capacity: Very low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Udipsamments and similar soils: 50 to 70 percent
Urban land: 30 to 50 percent
Contrasting inclusions: 0 to 20 percent

Inclusions

Contrasting inclusions:
- The very poorly drained Deford soils

Similar inclusions:
- Soils that have fine sand in the profile
- Soils that have a darker subsoil
- Soils that have stratified very fine sand and silt in the substratum

Use and Management

Dominant land use: Udipsamments—gardens, lawns, building sites, idle land; Urban land—streets, parking lots, sites for buildings and other structures

Gardens, lawns, and environmental plantings

Major management concerns: Low available water capacity, soil blowing
Management considerations
- Irrigation may be needed to maintain lawns and gardens.
- Perennial plants that can withstand droughtiness should be selected for planting.
- A good plant cover and mulch can help to control soil blowing.

Building sites

Major management concerns: Udipsamments—cutbanks caving
Management considerations:
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.

Septic tank absorption fields

Major management concerns: Udipsamments—rapid permeability
Management considerations:
- The poor filtering capacity of these soils can result in the pollution of ground water.
- Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
- Sanitary facilities should be connected to public sewers and sewage treatment facilities.

Interpretive Groups

Land capability classification: Udipsamments—VIIs
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned

360—Wakeley muck

Setting

Landform: Lake plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Surface layer:
0 to 5 inches—black muck

Substratum:
5 to 16 inches—dark grayish brown and grayish brown, mottled sand
16 to 27 inches—brown, mottled sand
27 to 80 inches—reddish brown and pinkish gray, mottled clay

Soil Properties and Qualities

Permeability: Rapid in the sandy part and very slow in the clayey part
Available water capacity: Moderate
Drainage class: Very poorly drained
Seasonal high water table: Perched 1 foot above to 1 foot below the surface at some time from October through May
Surface runoff: Very slow or ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: High
Potential for frost action: Moderate

Composition

Wakeley soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The very poorly drained, sandy Leafriver soils
- The somewhat poorly drained Allendale soils

Similar inclusions:
- Soils that have thinner layers of sand
- Soils that have clay below a depth of 40 inches

Use and Management

Dominant land use: Woodland
Other uses: Pasture

Pasture

Major management concerns: Seasonal wetness, overgrazing

Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Hay and pasture plants that can withstand periodic inundation and seasonal wetness should be seeded.
• Applying lime and fertilizer according to soil tests can help to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, plant competition, seasonal wetness, seedling mortality, windthrow hazard
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.
• Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings are beneficial for natural regeneration.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Building sites

Major management concerns: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 3W
Michigan soil management group: 4/1c

367A—Whittemore-Springport complex, 0 to 3 percent slopes

Setting

Landform: Lake plains (fig. 10)
Slope range: Whittemore—0 to 3 percent; Springport—0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 500 acres

Typical Profile

Whittemore

Surface layer:
0 to 9 inches—very dark gray sand

Subsurface layer:
9 to 12 inches—light grayish brown and light gray sand

Subsoil:
12 to 17 inches—dark reddish brown, mottled, strongly cemented, firm sand
17 to 35 inches—yellowish brown and light yellowish brown, mottled, loose sand
35 to 44 inches—light reddish brown, mottled, firm silty clay

Substratum:
44 to 80 inches—reddish brown, mottled silty clay

Springport

Surface layer:
0 to 10 inches—very dark gray silty clay loam

Subsoil:
10 to 36 inches—dark gray and gray, mottled, firm silty clay loam

Substratum:
36 to 50 inches—reddish brown, mottled silty clay loam
50 to 80 inches—reddish brown, mottled silt loam

Soil Properties and Qualities

Permeability: Whittemore—moderately rapid in the sandy part and very slow in the clayey part; Springport—very slow
Available water capacity: Whittemore—low; Springport—high
Drainage class: Whittemore—somewhat poorly drained; Springport—poorly drained
Seasonal high water table: Whittemore—perched at a depth of 0.5 foot to 1.5 feet at some time from October through May; Springport—perched 1 foot above to 1 foot below the surface at some time from October through June
Surface runoff: Whittemore—very slow; Springport—very slow or ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Whittemore—severe; Springport—moderate
Shrink-swell potential: High

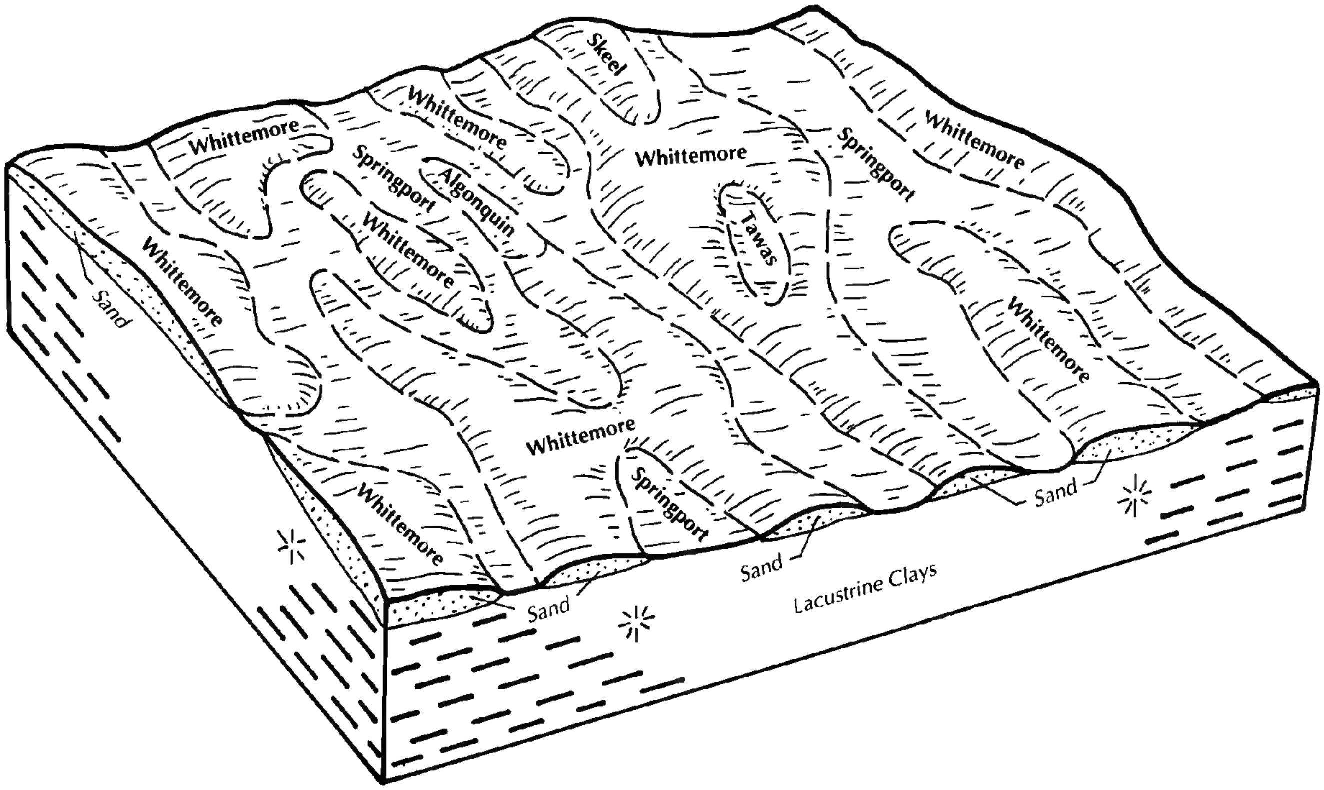

Figure 10.—Typical pattern of soils on the landscape in an area of Whittemore-Springport complex, 0 to 3 percent slopes.

Potential for frost action: Whittemore—high; Springport—high

Composition

Whittemore soil and similar soils: 50 to 60 percent
Springport soil and similar soils: 30 to 40 percent
Contrasting inclusions: 0 to 20 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained, clayey Algonquin soils
- The moderately well drained Skeel soils
- The very poorly drained Tawas soils

Similar inclusions:
- Sandy soils that have a lighter colored subsoil
- Loamy soils that have a mucky surface layer
- Sandy soils that contain less than 50 percent ortstein in the subsoil

Use and Management

Dominant land use: Woodland
Other uses: Cropland, pasture

Cropland

Major management concerns: Whittemore—seasonal wetness, restricted permeability, soil blowing, nutrient and pesticide loss; Springport—seasonal wetness, restricted permeability, tilth of the surface layer, soil compaction
Management considerations:
- Subsurface drains can reduce the wetness if a suitable outlet is available.
- Because of the restricted permeability, subsurface drains should be narrowly spaced.
- Shallow surface ditches help to remove surface water after heavy rains.
- Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.
- Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing in areas of the Whittemore soil. Maintaining a permanent plant cover also helps to control soil blowing.

• Because of the risk of ground-water pollution in areas of the Whittemore soil, nutrients in manure and fertilizer applications should not exceed the requirements of the plants.

Pasture

Major management concerns: Whittemore—seasonal wetness; Springport—seasonal wetness, compaction
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Restricted grazing during wet periods helps to prevent compaction and poor tilth in areas of the Springport soil.

Woodland

Major management concerns: Equipment limitations, plant competition, seedling mortality, windthrow hazard, seasonal wetness
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has adequate snow cover.
• Trees that can withstand seasonal wetness should be selected for planting in areas of the Whittemore soil.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted in areas of the Springport soil.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Building sites

Major management concerns: Whittemore—cutbanks caving, seasonal wetness, shrink-swell; Springport—ponding
Management considerations:
• Because cutbanks in areas of the Whittemore soil are not stable and are subject to caving, trench walls should be reinforced.
• In areas of the Whittemore soil, buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• In areas of the Whittemore soil, wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling in areas of the Whittemore soil.
• Because of ponding, the Springport soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Whittemore—seasonal wetness, rapid permeability, restricted permeability; Springport—ponding
Management considerations:
• The poor filtering capacity of the Whittemore soil can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
• In areas of the Whittemore soil, filling or mounding with suitable fill material helps to raise the absorption field above the water table.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability of the Whittemore soil.
• Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability of the Whittemore soil.
• Because of ponding, the Springport soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: Whittemore—4W; Springport—6W
Michigan soil management group: Whittemore—5/2b; Springport—1c

368A—Au Gres-Deford complex, 0 to 3 percent slopes

Setting

Landform: Lake plains, moraines, deltas, and outwash plains
Slope range: Au Gres—0 to 3 percent; Deford—0 to 2 percent
Shape of areas: Irregular
Size of areas: 50 to 800 acres

Typical Profile

Au Gres

Surface layer:
0 to 3 inches—black, partially decomposed leaf litter

Subsurface layer:
3 to 9 inches—pinkish gray, mottled sand

Subsoil:
9 to 14 inches—dark reddish brown and dark brown, mottled, very friable sand
14 to 29 inches—yellowish brown, mottled, loose sand

Substratum:
29 to 80 inches—very pale brown sand

Deford

Surface layer:
0 to 5 inches—black muck

Substratum:
5 to 21 inches—light brownish gray, mottled sand
21 to 42 inches—pale brown and grayish brown fine sand
42 to 80 inches—grayish brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Au Gres—somewhat poorly drained; Deford—very poorly drained
Seasonal high water table: Au Gres—apparent, at a depth of 0.5 foot to 1.5 feet at some time from October through May; Deford—apparent, 1 foot above to 1 foot below the surface at some time from October through May
Surface runoff: Au Gres—very slow; Deford—very slow or ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Au Gres—severe; Deford—moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

Au Gres soil and similar soils: 60 to 70 percent
Deford soil and similar soils: 15 to 30 percent
Contrasting inclusions: 0 to 25 percent

Inclusions

Contrasting inclusions:
• The excessively drained Grayling soils
• The very poorly drained Tawas soils that have more than 16 inches of muck at the surface

Similar inclusions:
• Very poorly drained soils that have a surface layer of sand
• Soils that have a lighter colored subsoil
• Soils that have clay below a depth of 40 inches

Use and Management

Dominant land use: Woodland
Other uses: Pasture

Pasture

Major management concerns: Au Gres—seasonal wetness, seasonal droughtiness; Deford—seasonal wetness
Management considerations:
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Applying lime and fertilizer according to soil tests can help to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, windthrow hazard, plant competition, seedling mortality, seasonal wetness
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has adequate snow cover.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.
• Trees that can withstand seasonal wetness should be selected for planting in areas of the Au Gres soil.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted in areas of the Deford soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Building sites

Major management concerns: Au Gres—cutbanks caving, seasonal wetness; Deford—ponding
Management considerations:
• Because cutbanks in areas of the Au Gres soil are not stable and are subject to caving, trench walls should be reinforced.
• In areas of the Au Gres soil, wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.
• In areas of the Au Gres soil, buildings can be constructed on well compacted fill material, which

raises the site a sufficient distance above the water table.
• Because of ponding, the Deford soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Au Gres—rapid permeability, seasonal wetness; Deford—ponding
Management considerations:
• The poor filtering capacity of the Au Gres soil can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
• Filling or mounding with suitable fill material helps to raise the absorption field above the water table in areas of the Au Gres soil.
• Because of ponding, the Deford soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: Au Gres—6W; Deford—4W
Michigan soil management group: Au Gres—5b; Deford—4c

369—Deford muck

Setting

Landform: Lake plains, deltas, moraines, and outwash plains
Slope range: 0 to 2 percent
Shape of areas: Irregular or linear
Size of areas: 3 to 200 acres

Typical Profile

Surface layer:
0 to 5 inches—black muck

Substratum:
5 to 21 inches—light brownish gray, mottled sand
21 to 42 inches—pale brown and grayish brown fine sand
42 to 80 inches—grayish brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Very poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from October through May
Surface runoff: Very slow or ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

Deford soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The very poorly drained Tawas soils that have more than 16 inches of muck at the surface
• The somewhat poorly drained Au Gres soils
• The somewhat poorly drained Finch soils

Similar inclusions:
• Soils that have strata of coarse sand in the substratum
• Soils that have a surface layer of sand
• Soils that have clay below a depth of 40 inches

Use and Management

Dominant land use: Woodland
Other uses: Pasture

Pasture

Major management concerns: Seasonal wetness, overgrazing
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.

Woodland

Major management concerns: Plant competition, seedling mortality, equipment limitations, windthrow hazard, seasonal wetness
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has adequate snow cover.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.

Building sites

Major management concerns: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 4W
Michigan soil management group: 4c

370A—McIvor sand, 0 to 3 percent slopes

Setting

Landform: Lake plains
Shape of areas: Irregular
Size of areas: 5 to 250 acres

Typical Profile

Surface layer:
0 to 2 inches—undecomposed leaf litter

Subsurface layer:
2 to 4 inches—dark gray sand
4 to 10 inches—pinkish gray sand
10 to 20 inches—pinkish gray and white, mottled sand

Subsoil:
20 to 26 inches—dark reddish brown and yellowish brown, mottled, firm, weakly to strongly cemented sand
26 to 31 inches—dark yellowish brown, mottled, loose sand

Substratum:
31 to 58 inches—pale brown sand
58 to 80 inches—reddish brown silty clay

Soil Properties and Qualities

Permeability: Moderately rapid in the sandy part and very slow in the clayey part
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched at a depth of 0.5 foot to 1.5 feet at some time from October through May
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

McIvor soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Proper soils
• The very poorly drained Tawas soils
• The very poorly drained Wabun soils

Similar inclusions:
• Soils that have a silty clay substratum within a depth of 40 inches
• Soils that do not have cementation in the subsoil
• Soils that do not have clay in the substratum

Use and Management

Dominant land use: Woodland
Other uses: Pasture

Pasture

Major management concerns: Seasonal wetness, seasonal droughtiness, overgrazing
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.

Woodland

Major management concerns: Equipment limitations, plant competition, seedling mortality, windthrow hazard, seasonal wetness
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has adequate snow cover.
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Trees that can withstand seasonal wetness should be selected for planting.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

• Carefully managed reforestation helps to control undesirable understory plants.

Building sites

Major management concerns: Cutbanks caving, seasonal wetness
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Seasonal wetness, rapid permeability, restricted permeability
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: IVw
Woodland ordination symbol: 2W
Michigan soil management group: 5b-h

371—Springport silt loam

Setting

Landform: Lake plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Surface layer:
0 to 11 inches—very dark gray silt loam

Subsoil:
11 to 27 inches—grayish brown, mottled, firm silty clay

Substratum:
27 to 80 inches—pinkish gray, mottled silty clay

Soil Properties and Qualities

Permeability: Very slow
Available water capacity: High
Drainage class: Poorly drained
Seasonal high water table: Perched 1 foot above to 1 foot below the surface at some time from October through June
Surface runoff: Very slow or ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: High
Potential for frost action: High

Composition

Springport soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Whittemore soils
• The somewhat poorly drained Algonquin soils

Similar inclusions:
• Soils that have a mucky surface layer
• Soils that have a surface layer of sandy loam
• Soils that have sand below a depth of 60 inches

Use and Management

Dominant land use: Woodland
Other uses: Pasture, cropland

Cropland

Major management concerns: Seasonal wetness, tilth in the surface layer, soil compaction, restricted permeability, ponding
Management considerations:
• Shallow surface ditches help to remove surface water after heavy rains.
• Both surface and subsurface drainage systems are needed to reduce the wetness.
• Subsurface drains can be used if a suitable outlet is available.
• Because of the restricted permeability, subsurface drains should be narrowly spaced.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.
• Minimizing tillage and tilling and harvesting at the

proper soil moisture content help to prevent excessive compaction and maintain tilth.

Pasture

Major management concerns: Seasonal wetness, compaction
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Restricted grazing during wet periods helps to prevent compaction and poor tilth.
• Hay and pasture plants that can withstand periodic inundation and seasonal wetness should be seeded.

Woodland

Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Because of the restricted permeability and the sticky and plastic subsoil, logging roads should be graveled and in some areas landings should be stabilized.
• Skidders should not be used during wet periods, when ruts form easily.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.

Building sites

Major management concerns: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 6W
Michigan soil management group: 1c

372B—Proper-Leafriver complex, 0 to 6 percent slopes

Setting

Landform: Beach ridges on lake plains
Slope range: Proper—0 to 6 percent; Leafriver—0 to 1 percent
Shape of areas: Linear
Size of areas: 10 to 300 acres

Typical Profile

Proper

Surface layer:
0 to 2 inches—black, partially decomposed leaf litter

Subsurface layer:
2 to 12 inches—dark grayish brown and grayish brown sand

Subsoil:
12 to 19 inches—dark brown, very friable sand with columns of strongly cemented sand
19 to 26 inches—brownish yellow, loose sand with columns of weakly cemented sand
26 to 40 inches—brownish yellow, mottled, loose sand with columns of weakly cemented sand

Substratum:
40 to 80 inches—pale brown and light yellowish brown, mottled sand

Leafriver

Surface layer:
0 to 10 inches—black muck
10 to 14 inches—black sand
14 to 35 inches—dark brownish gray, loose sand

Substratum:
35 to 60 inches—dark gray sand
60 to 80 inches—brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Proper—low; Leafriver—moderate
Drainage class: Proper—moderately well drained; Leafriver—very poorly drained
Seasonal high water table: Proper—apparent, at a depth of 2.0 to 3.5 feet at some time from November through May; Leafriver—apparent, 1 foot above to 1 foot below the surface at some time from November through July
Surface runoff: Proper—very slow; Leafriver—very slow or ponded

Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Proper—severe; Leafriver—moderate
Shrink-swell potential: Low
Potential for frost action: Proper—low; Leafriver—high

Composition

Proper soil and similar soils: 65 to 75 percent
Leafriver soil and similar soils: 25 to 35 percent
Contrasting inclusions: 5 to 25 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Au Gres soils
- The very poorly drained, sandy over clayey Wakeley soils

Similar inclusions:
- Very poorly drained soils that do not have muck at the surface
- Sandy soils that do not have a cemented subsoil
- Soils that have a thicker organic layer

Use and Management

Dominant land use: Woodland

Woodland

Major management concerns: Proper—equipment limitations, seedling mortality, windthrow hazard, plant competition, seasonal droughtiness; Leafriver—equipment limitations, seedling mortality, windthrow hazard, plant competition, seasonal wetness
Management considerations:
- The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
- Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
- Because loose sand can interfere with the traction of wheeled equipment in areas of the Proper soil, logging roads should be stabilized.
- Landing sites generally can be used only during the driest time of the year.
- Special harvest methods may be needed to control undesirable plants.
- Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate in areas of the Proper soil. Replanting is needed in some areas.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
- Because of wetness, seedling mortality, and plant competition, trees are generally not planted on the Leafriver soil.

Building sites

Major management concerns: Proper—cutbanks caving, seasonal wetness; Leafriver—ponding
Management considerations:
- Because cutbanks in areas of the Proper soil are not stable and are subject to caving, trench walls should be reinforced.
- In areas of the Proper soil, buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
- In areas of the Proper soil, wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.
- Because of ponding, the Leafriver soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Proper—seasonal wetness, rapid permeability; Leafriver—ponding
Management considerations:
- The poor filtering capacity of the Proper soil can result in the pollution of ground water.
- Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
- In areas of the Proper soil, filling or mounding with suitable fill material helps to raise the absorption field above the water table.
- Because of ponding, the Leafriver soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIw
Woodland ordination symbol: Proper—5W; Leafriver—2W
Michigan soil management group: Proper—5a-h; Leafriver—5c

375—Kanotin muck

Setting

Landform: Lake plains
Slope range: 0 to 2 percent
Shape of areas: Oval or irregular
Size of areas: 3 to 150 acres

Typical Profile

Surface layer:
0 to 9 inches—black muck

Subsurface layer:
9 to 12 inches—grayish brown sand

Subsoil:
12 to 26 inches—black, loose sand
26 to 46 inches—strong brown, loose sand

Substratum:
46 to 51 inches—brownish yellow sand
51 to 58 inches—dark brown, mottled, stratified very fine sand and silt loam
58 to 80 inches—gray silty clay

Soil Properties and Qualities

Permeability: Rapid in the sandy part and very slow in the loamy and clayey parts
Available water capacity: Low
Drainage class: Very poorly drained
Seasonal high water table: Perched 1 foot above to 1 foot below the surface at some time from October through May
Surface runoff: Very slow or ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

Kanotin soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained McIvor soils
• The very poorly drained Wabun soils, which do not have a black and brown subsoil

Similar inclusions:
• Soils that have a thinner organic surface layer
• Soils that do not have clay in the substratum
• Soils that have a thicker organic surface layer

Use and Management

Dominant land use: Woodland

Woodland

Major management concerns: Equipment limitations, plant competition, seedling mortality, windthrow hazard, seasonal wetness
Management considerations:
• This soil is generally unsuited to woodland because of extreme acidity, the low strength of the organic material, and the wetness. Overcoming these limitations is not practical.
• Tree cover is sparse, but some spruce, tamarack, and jack pine grow around the edges of the unit. Shrubs are the most common vegetation.

Building sites

Major management concerns: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 3W
Michigan soil management group: 5c-a

377—Wabun mucky sand

Setting

Landform: Lake plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Surface layer:
0 to 6 inches—black mucky sand

Substratum:
6 to 10 inches—gray sand
10 to 30 inches—light brownish gray, mottled sand
30 to 48 inches—dark grayish brown, mottled sand
48 to 58 inches—grayish brown, stratified sand and fine sand
58 to 80 inches—gray silty clay

Soil Properties and Qualities

Permeability: Rapid in the sandy part and very slow in the clayey part
Available water capacity: Low
Drainage class: Very poorly drained
Seasonal high water table: Perched 1 foot above to 1 foot below the surface at some time from October through May
Surface runoff: Very slow or ponded
Flooding: None

Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

Wabun soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The very poorly drained Tawas soils that have more than 16 inches of muck at the surface
• The somewhat poorly drained McIvor soils

Similar inclusions:
• Soils that do not have a stratified substratum
• Soils that have a clayey substratum below a depth of 60 inches

Use and Management

Dominant land use: Woodland

Woodland

Major management concerns: Equipment limitations, plant competition, seedling mortality, windthrow hazard, seasonal wetness
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has adequate snow cover.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Special harvest methods may be needed to control undesirable plants.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.

Building sites

Major management concerns: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 3W
Michigan soil management group: 4c

378A—Algonquin clay, 0 to 3 percent slopes

Setting

Landform: Lake plains
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Surface layer:
0 to 9 inches—very dark grayish brown clay

Subsoil:
9 to 13 inches—brown, mottled, firm clay
13 to 17 inches—reddish brown, mottled, firm silty clay

Substratum:
17 to 80 inches—reddish brown, mottled silty clay

Soil Properties and Qualities

Permeability: Very slow
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched at a depth of 0.5 foot to 1.5 feet at some time from October through May
Surface runoff: Slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: High
Potential for frost action: High

Composition

Algonquin soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, sandy over clayey Allendale soils
• The poorly drained Springport soils

Similar inclusions:
• Soils that have less clay in the subsoil
• Soils that have a surface layer of loam
• Soils that have sandy textures below a depth of 40 inches

Use and Management

Dominant land use: Cropland
Other uses: Woodland, pasture

Cropland

Major management concerns: Restricted permeability, seasonal wetness, soil compaction, tilth of the surface layer
Management considerations:
• Both surface and subsurface drainage systems are needed to reduce the wetness.
• Because of the restricted permeability, subsurface drains should be narrowly spaced.
• Crop residue management, green manure crops, applications of manure, cover crops, and conservation tillage help to maintain or improve tilth and increase the available water capacity and the organic matter content.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.

Pasture

Major management concerns: Compaction, seasonal wetness
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Hay and pasture plants that can withstand periodic inundation and seasonal wetness should be planted.

Woodland

Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition
Management considerations:
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Because of the restricted permeability and the sticky and plastic subsoil, logging roads should be graveled and in some areas landings should be stabilized.
• Trees that can withstand seasonal wetness should be selected for planting.
• If trees are planted, site preparation is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.

Building sites

Major management concerns: Seasonal wetness, shrink-swell
Management considerations:
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Major management concerns: Seasonal wetness, restricted permeability
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• A subsurface drainage system helps to lower the water table.
• Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 6W
Michigan soil management group: 1b

379A—Algonquin-Springport complex, 0 to 3 percent slopes

Setting

Landform: Lake plains
Slope range: Algonquin—0 to 3 percent; Springport—0 to 2 percent
Shape of areas: Irregular
Size of areas: 50 to 300 acres

Typical Profile

Algonquin

Surface layer:
0 to 9 inches—very dark grayish brown clay

Subsoil:
9 to 13 inches—brown, mottled, firm clay
13 to 17 inches—reddish brown, mottled, firm silty clay

Substratum:
17 to 80 inches—reddish brown, mottled silty clay

Springport

Surface layer:
0 to 11 inches—very dark gray silt loam

Subsoil:
11 to 27 inches—grayish brown, mottled, firm silty clay

Substratum:
27 to 80 inches—pinkish gray, mottled silty clay

Soil Properties and Qualities

Permeability: Very slow
Available water capacity: Algonquin—moderate; Springport—high
Drainage class: Algonquin—somewhat poorly drained; Springport—poorly drained
Seasonal high water table: Algonquin—perched at a depth of 0.5 foot to 1.5 feet at some time from October through May; Springport—perched 1 foot above to 1 foot below the surface at some time from October through June
Surface runoff: Algonquin—slow; Springport—very slow or ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Algonquin—moderate; Springport—slight
Shrink-swell potential: High
Potential for frost action: High

Composition

Algonquin soil and similar soils: 60 to 70 percent
Springport soil and similar soils: 30 to 40 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, sandy over clayey Allendale soils
• The very poorly drained, sandy over clayey Wakeley soils

Similar inclusions:
• Poorly drained soils that have a mucky surface layer
• Soils that have a sandy surface layer
• Soils that are moderately well drained

Use and Management

Dominant land use: Woodland
Other uses: Cropland, pasture

Cropland

Major management concerns: Seasonal wetness, restricted permeability, soil compaction, tilth of the surface layer in areas of both soils; ponding an additional concern in areas of the Springport soil
Management considerations:
• Shallow surface ditches help to remove surface water after heavy rains.
• Both surface and subsurface drainage systems are needed to reduce the wetness.
• Because of the restricted permeability, subsurface drains should be narrowly spaced.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.

Pasture

Major management concerns: Seasonal wetness, compaction
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Hay and pasture plants that can withstand periodic inundation and seasonal wetness should be seeded.

Woodland

Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Because of the restricted permeability and the sticky and plastic subsoil, logging roads should be graveled and in some areas landings should be stabilized.
• Skidders should not be used during wet periods, when ruts form easily.
• Trees that can withstand seasonal wetness should be selected for planting on the Algonquin soil.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on the Springport soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Special harvest methods may be needed to control undesirable plants.

Building sites

Major management concerns: Algonquin—shrink-swell, seasonal wetness; Springport—ponding
Management considerations:
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.
• In areas of the Algonquin soil, buildings can be constructed on well compacted fill material, which

raises the site a sufficient distance above the water table.
• Because of ponding, the Springport soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Algonquin—seasonal wetness, restricted permeability; Springport—ponding
Management considerations:
• In areas of the Algonquin soil, filling or mounding with suitable material helps to raise the absorption field above the water table.
• Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability of the Algonquin soil.
• Because of ponding, the Springport soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 6W
Michigan soil management group: Algonquin—1b; Springport—1c

380—Access denied

Shape of areas: Square or rectangular
Size of areas: 20 to 160 acres

Use and Management

Management considerations:
• Because access to these areas was denied, information concerning use and management is not available. Onsite investigation is needed.

Interpretive Groups

Land capability classification: None assigned
Woodland ordination symbol: None assigned
Michigan soil management group: None assigned

381A—McIvor-Wakeley complex, 0 to 3 percent slopes

Setting

Landform: Lake plains
Slope range: McIvor—0 to 3 percent; Wakeley—0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 200 acres

Typical Profile

McIvor

Surface layer:
0 to 2 inches—undecomposed leaf litter

Subsurface layer:
2 to 4 inches—dark gray sand
4 to 10 inches—pinkish gray sand
10 to 20 inches—pinkish gray and white, mottled sand

Subsoil:
20 to 26 inches—dark reddish brown and yellowish brown, mottled, firm, weakly to strongly cemented sand
26 to 31 inches—dark yellowish brown, mottled, loose sand

Substratum:
31 to 58 inches—pale brown sand
58 to 80 inches—reddish brown silty clay

Wakeley

Surface layer:
0 to 5 inches—black muck

Substratum:
5 to 16 inches—dark grayish brown and grayish brown, mottled sand
16 to 27 inches—brown, mottled sand
27 to 80 inches—reddish brown and pinkish gray, mottled clay

Soil Properties and Qualities

Permeability: McIvor—moderately rapid in the sandy part and very slow in the clayey part; Wakeley—rapid in the sandy part and very slow in the clayey part
Available water capacity: McIvor—low; Wakeley—moderate
Drainage class: McIvor—somewhat poorly drained; Wakeley—very poorly drained
Seasonal high water table: McIvor—perched at a depth of 0.5 foot to 1.5 feet at some time from October through May; Wakeley—perched 1 foot above to 1 foot below the surface at some time from October through May
Surface runoff: McIvor—very slow; Wakeley—very slow or ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: McIvor—severe; Wakeley—moderate

Shrink-swell potential: McIvor—low; Wakeley—high
Potential for frost action: Moderate

Composition

McIvor soil and similar soils: 40 to 50 percent
Wakeley soil and similar soils: 30 to 40 percent
Contrasting inclusions: 10 to 25 percent

Inclusions

Contrasting inclusions:
- The very poorly drained, sandy Deford soils
- The somewhat poorly drained, sandy Au Gres soils

Similar inclusions:
- Poorly drained soils that have a clayey substratum at a depth of more than 40 inches
- Soils that do not have clay in the substratum
- Areas of McIvor soils in which less than 90 percent of the subsoil is cemented

Use and Management

Dominant land use: Woodland
Other uses: Pasture

Pasture

Major management concerns: McIvor—seasonal wetness, seasonal droughtiness; Wakeley—seasonal wetness
Management considerations:
- Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
- Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.

Woodland

Major management concerns: Equipment limitations, plant competition, seedling mortality, windthrow hazard, seasonal wetness
Management considerations:
- The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, and midwinter, when the soil is frozen or has an adequate snow cover.
- In areas of the McIvor soil, loose sand can interfere with the traction of wheeled equipment. Logging roads should be stabilized.
- Trees that can withstand seasonal wetness should be selected for planting on the McIvor soil.
- Because of wetness, seedling mortality, and plant competition, trees are generally not planted on the Wakeley soil.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
- Carefully managed reforestation helps to control undesirable understory plants.
- Special harvest methods may be needed to control undesirable plants.

Building sites

Major management concerns: McIvor—cutbanks caving, seasonal wetness; Wakeley—ponding
Management considerations:
- Because cutbanks in areas of the McIvor soil are not stable and are subject to caving, trench walls should be reinforced.
- In areas of the McIvor soil, buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
- In areas of the McIvor soil, wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.
- Because of ponding, the Wakeley soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: McIvor—seasonal wetness, rapid permeability; Wakeley—ponding
Management considerations:
- The poor filtering capacity of the McIvor soil can result in the pollution of ground water.
- Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
- In areas of the McIvor soil, filling or mounding with suitable fill material helps to raise the absorption field above the water table.
- Because of ponding, the Wakeley soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: IVw
Woodland ordination symbol: McIvor—2W; Wakeley—3W
Michigan soil management group: McIvor—5b-h; Wakeley—4/1c

382B—Proper sand, 0 to 6 percent slopes

Setting

Landform: Beach ridges and dunes
Shape of areas: Irregular
Size of areas: 3 to 50 acres

Typical Profile

Surface layer:
0 to 2 inches—black, partially decomposed leaf litter

Subsurface layer:
2 to 12 inches—dark grayish brown and grayish brown sand

Subsoil:
12 to 19 inches—dark brown, very friable sand with columns of strongly cemented sand
19 to 26 inches—brownish yellow, loose sand with columns of weakly cemented sand
26 to 40 inches—brownish yellow, mottled, loose sand with columns of weakly cemented sand

Substratum:
40 to 80 inches—pale brown and light yellowish brown, mottled sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: Apparent, at a depth of 2.0 to 3.5 feet at some time from November through May
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Proper soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Finch soils

Similar inclusions:
- Soils in which less than 50 percent of the subsoil is cemented
- Soils that have a clayey substratum
- Well drained soils in areas where the slopes are more than 6 percent

Use and Management

Dominant land use: Woodland

Woodland

Major management concerns: Equipment limitations, seedling mortality, seasonal droughtiness, plant competition
Management considerations:
- Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
- Planting when the soil is moist can reduce the seedling mortality rate.
- Carefully managed reforestation helps to control undesirable understory plants.
- Special harvest methods may be needed to control undesirable plants.

Building sites

Major management concerns: Cutbanks caving, seasonal wetness
Management considerations:
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
- Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
- Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Seasonal wetness, rapid permeability
Management considerations:
- The poor filtering capacity of this soil can result in the pollution of ground water.
- Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
- Filling or mounding with suitable material helps to raise the absorption field above the water table.
- A subsurface drainage system helps to lower the water table.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 5W
Michigan soil management group: 5a-h

383B—Wurtsmith sand, 0 to 6 percent slopes

Setting

Landform: Outwash plains, river terraces, and lake plains
Shape of areas: Irregular

Size of areas: 10 to 100 acres

Typical Profile

Surface layer:
0 to 1 inch—black, partially decomposed leaf litter

Subsurface layer:
1 to 4 inches—grayish brown sand

Subsoil:
4 to 14 inches—yellowish brown, very friable sand
14 to 24 inches—brownish yellow, very friable sand

Substratum:
24 to 80 inches—pale brown and brown, mottled sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Moderately well drained
Seasonal high water table: Apparent, at a depth of 2.0 to 3.5 feet at some time from November through May
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Wurtsmith soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Au Gres soils
- The excessively drained Grayling soils
- The somewhat excessively drained Graycalm soils

Similar inclusions:
- Soils that have a darker substratum

Use and Management

Dominant land use: Woodland

Woodland

Major management concerns: Equipment limitations, seedling mortality, seasonal droughtiness, windthrow hazard
Management considerations:
- Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Replanting is needed in some areas.
- Planting when the soil is moist can reduce the seedling mortality rate.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Building sites

Major management concerns: Cutbanks caving, seasonal wetness
Management considerations:
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
- Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
- Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Seasonal wetness, rapid permeability
Management considerations:
- The poor filtering capacity of this soil can result in the pollution of ground water.
- Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
- Filling or mounding with suitable material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: 6S
Michigan soil management group: 5a

392—Caffey mucky sand

Setting

Landform: Lake plains and till plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Surface layer:
0 to 8 inches—black mucky sand

Subsoil:
8 to 37 inches—brown and yellowish brown, mottled, very friable sand

Substratum:
37 to 80 inches—grayish brown, mottled loam

Soil Properties and Qualities

Permeability: Moderately rapid in the sandy part and moderately slow in the loamy part
Available water capacity: Low
Drainage class: Poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from October through May
Surface runoff: Very slow or ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

Caffey soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
- The very poorly drained Deford soils
- The somewhat poorly drained Kokosing soils

Similar inclusions:
- Soils that contain more clay in the substratum
- Soils that have a surface layer of sand

Use and Management

Dominant land use: Woodland
Other uses: Pasture

Woodland

Major management concerns: Equipment limitations, plant competition, seasonal wetness, seedling mortality, windthrow hazard
Management considerations:
- The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
- Selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings are beneficial for natural regeneration.
- Carefully managed reforestation helps to control undesirable understory plants.
- Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Building sites

Major management concerns: Ponding
Management considerations:
- Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Ponding
Management considerations:
- Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 2W
Michigan soil management group: 4/2c

403B—Iargo silt loam, 2 to 6 percent slopes

Setting

Landform: Lake plains
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Surface layer:
0 to 8 inches—very dark grayish brown silt loam

Subsoil:
8 to 12 inches—brown, firm silty clay
12 to 19 inches—strong brown, mottled, firm silty clay

Substratum:
19 to 45 inches—brown, mottled silty clay loam with strata of silt loam
45 to 80 inches—light olive brown and brown, mottled silt loam with strata of very fine sand and silty clay loam

Soil Properties and Qualities

Permeability: Slow
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 2.5 to 3.5 feet at some time from November through May

Surface runoff: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Slight
Shrink-swell potential: High
Potential for frost action: High

Composition

Iargo soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Allendale soils
• The poorly drained Springport soils

Similar inclusions:
• Soils in which the mottles are higher in the profile
• Soils that have less stratification in the substratum
• Soils that have sandy stratification below a depth of 60 inches

Use and Management

Dominant land use: Cropland
Other uses: Pasture, woodland

Cropland

Major management concerns: Seasonal wetness, soil compaction, tilth in the surface layer, water erosion, nutrient and pesticide loss
Management considerations:
• Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to prevent excessive soil loss.
• Conservation tillage systems, contour farming, cover crops, and sod-based rotations can minimize the detachment and loss of nutrients associated with sediment and thus help to prevent the loss of solid-phase nitrogen and phosphorus.
• Shallow surface ditches help to remove surface water after heavy rains.
• Subsurface drains can reduce the wetness if a suitable outlet is available.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.

Pasture

Major management concerns: Compaction, seasonal wetness
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Hay and pasture plants that can withstand periodic inundation and seasonal wetness should be seeded.
• Restricted grazing during wet periods helps to prevent compaction and poor tilth.

Woodland

Major management concerns: Equipment limitations, plant competition, seasonal wetness, windthrow hazard
Management considerations:
• Because of low strength, suitable surfacing material is needed on year-round logging roads and landings.
• Equipment should be used only when the soil is relatively dry or has an adequate snow cover.
• Skidders should not be used during wet periods, when ruts form easily.
• Landing sites generally can be used only during the driest time of the year.
• Trees that can withstand seasonal wetness should be selected for planting.
• Carefully managed reforestation helps to control undesirable understory plants.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Building sites

Major management concerns: Seasonal wetness, shrink-swell
Management considerations:
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Major management concerns: Restricted permeability, seasonal wetness
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• A subsurface drainage system helps to lower the water table.
• Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 3L
Michigan soil management group: 1.5a

403C—Iargo silt loam, 6 to 12 percent slopes

Setting

Landform: Lake plains
Shape of areas: Irregular
Size of areas: 5 to 25 acres

Typical Profile

Surface layer:
0 to 8 inches—very dark grayish brown silt loam

Subsoil:
8 to 12 inches—brown, firm silty clay
12 to 19 inches—strong brown, mottled, firm silty clay

Substratum:
19 to 45 inches—brown, mottled silty clay loam with strata of silt loam
45 to 80 inches—light olive brown and brown, mottled silt loam with strata of very fine sand and silty clay loam

Soil Properties and Qualities

Permeability: Slow
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 2.5 to 3.5 feet at some time from November through May
Surface runoff: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Slight
Shrink-swell potential: High
Potential for frost action: High

Composition

Iargo soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Allendale soils
- The poorly drained Springport soils

Similar inclusions:
- Soils in which the mottles are higher in the profile
- Soils that have less stratification in the substratum
- Soils that have sandy stratification below a depth of 60 inches

Use and Management

Dominant land use: Cropland
Other uses: Pasture, woodland

Cropland

Major management concerns: Seasonal wetness, soil compaction, tilth in the surface layer, water erosion, nutrient and pesticide loss
Management considerations:
- Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to prevent excessive soil loss.
- Shaping and maintaining grassed waterways promote the safe removal of runoff from the fields.
- Conservation tillage systems, contour farming, cover crops, and sod-based rotations can minimize the detachment and loss of nutrients associated with sediment and thus help to prevent the loss of solid-phase nitrogen and phosphorus.
- Shallow surface ditches help to remove surface water after heavy rains.
- Subsurface drains can reduce the wetness if a suitable outlet is available.
- Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.

Pasture

Major management concerns: Compaction, seasonal wetness
Management considerations:
- Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
- Hay and pasture plants that can withstand periodic inundation and seasonal wetness should be seeded.
- Restricted grazing during wet periods helps to prevent compaction and poor tilth.

Woodland

Major management concerns: Equipment limitations, plant competition, seasonal wetness, windthrow hazard
Management considerations:
- Because of low strength, suitable surfacing material is needed on year-round logging roads and landings.
- Equipment should be used only when the soil is relatively dry or has an adequate snow cover.

• Skidders should not be used during wet periods, when ruts form easily.
• Landing sites generally can be used only during the driest time of the year.
• Trees that can withstand seasonal wetness should be selected for planting.
• Carefully managed reforestation helps to control undesirable understory plants.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Building sites

Major management concerns: Seasonal wetness, shrink-swell, slope
Management considerations:
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.
• Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Major management concerns: Restricted permeability, seasonal wetness, slope
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• A subsurface drainage system helps to lower the water table.
• Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 3L
Michigan soil management group: 1.5a

404A—Manary silty clay loam, 0 to 3 percent slopes

Setting

Landform: Lake plains
Shape of areas: Irregular
Size of areas: 3 to 200 acres

Typical Profile

Surface layer:
0 to 11 inches—black silty clay loam

Subsoil:
11 to 18 inches—brown, mottled, firm silty clay loam

Substratum:
18 to 29 inches—reddish brown, mottled silty clay
29 to 80 inches—brown and reddish brown silty clay loam with strata of brown and pale brown loamy fine sand

Soil Properties and Qualities

Permeability: Slow
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched at a depth of 0.5 foot to 1.5 feet at some time from October through May
Surface runoff: Slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: High
Potential for frost action: High

Composition

Manary soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, sandy over clayey Allendale soils
• The poorly drained Springport soils

Similar inclusions:
• Soils that have a surface layer of loam

Use and Management

Dominant land use: Cropland
Other uses: Pasture, woodland

Cropland

Major management concerns: Restricted permeability,

seasonal wetness, soil compaction, tilth in the surface layer

Management considerations:

• Most adapted crops can be grown if an adequate drainage system is installed.

• Subsurface drains can reduce the wetness if a suitable outlet is available.

• Because of the restricted permeability, subsurface drains should be narrowly spaced.

• Shallow surface ditches help to remove surface water after heavy rains.

• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.

• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.

Pasture

Major management concerns: Compaction, seasonal wetness

Management considerations:

• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.

• Hay and pasture plants that can withstand periodic inundation and seasonal wetness should be seeded.

• Restricted grazing during wet periods helps to prevent compaction and poor tilth.

Woodland

Major management concerns: Equipment limitations, plant competition, windthrow hazard, seasonal wetness

Management considerations:

• Because of low strength, suitable surfacing material is needed on year-round logging roads and landings.

• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.

• Skidders should not be used during wet periods, when ruts form easily.

• Trees that can withstand seasonal wetness should be selected for planting.

• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

• Carefully managed reforestation helps to control undesirable understory plants.

Building sites

Major management concerns: Seasonal wetness, shrink-swell

Management considerations:

• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.

• Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.

• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Major management concerns: Seasonal wetness, restricted permeability

Management considerations:

• Filling or mounding with suitable material helps to raise the absorption field above the water table.

• A subsurface drainage system helps to lower the water table.

• Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability.

• Backfilling the trenches with porous material helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 4C
Michigan soil management group: 1.5b

405B—Manary-largo complex, 0 to 6 percent slopes

Setting

Landform: Lake plains
Slope range: Manary—0 to 3 percent; largo—2 to 6 percent
Shape of areas: Irregular
Size of areas: 20 to 200 acres

Typical Profile

Manary

Surface layer:
0 to 11 inches—black silty clay loam

Subsoil:
11 to 18 inches—brown, mottled, firm silty clay loam

Substratum:
18 to 29 inches—reddish brown, mottled silty clay
29 to 80 inches—brown and reddish brown silty clay loam with strata of brown and pale brown loamy fine sand

Iargo

Surface layer:
0 to 8 inches—very dark grayish brown silt loam

Subsoil:
8 to 12 inches—brown, firm silty clay
12 to 19 inches—strong brown, mottled, firm silty clay

Substratum:
19 to 45 inches—brown, mottled silty clay loam with strata of silt loam
45 to 80 inches—light olive brown and brown, mottled silt loam with strata of very fine sand and silty clay loam

Soil Properties and Qualities

Permeability: Slow
Available water capacity: Moderate
Drainage class: Manary—somewhat poorly drained; Iargo—moderately well drained
Seasonal high water table: Manary—perched at a depth of 0.5 foot to 1.5 feet at some time from October through May; Iargo—perched at a depth of 2.5 to 3.5 feet at some time from November through May
Surface runoff: Manary—slow; Iargo—medium
Flooding: None
Hazard of water erosion: Manary—slight; Iargo—moderate
Hazard of soil blowing: Manary—moderate; Iargo—slight
Shrink-swell potential: High
Potential for frost action: High

Composition

Manary soil and similar soils: 50 to 60 percent
Iargo soil and similar soils: 40 to 50 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The poorly drained Springport soils
• The somewhat poorly drained, sandy over clayey Allendale soils

Similar inclusions:
• Soils that have a surface layer of loam
• Soils that have less stratification in the substratum

Use and Management

Dominant land use: Cropland
Other uses: Pasture, woodland

Cropland

Major management concerns: Manary—seasonal wetness, soil compaction, tilth in the surface layer, restricted permeability; Iargo—seasonal wetness, soil compaction, tilth in the surface layer, restricted permeability, water erosion, nutrient and pesticide loss
Management considerations:
• Shallow surface ditches help to remove surface water after heavy rains.
• Subsurface drains can reduce the wetness if a suitable outlet is available.
• Because of the restricted permeability, subsurface drains should be narrowly spaced.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.
• Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to prevent excessive soil loss in areas of the Iargo soil.
• Conservation tillage, crop residue management, windbreaks, and cover crops help to control soil blowing in areas of the Iargo soil.
• In areas of the Iargo soil, conservation tillage systems, contour farming, cover crops, and sod-based rotations can minimize the detachment and loss of nutrients associated with sediment and thus help to prevent the loss of solid-phase nitrogen and phosphorus.

Pasture

Major management concerns: Compaction, seasonal wetness
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Hay and pasture plants that can withstand periodic inundation and seasonal wetness should be seeded.
• Restricted grazing during wet periods helps to prevent compaction and poor tilth.

Woodland

Major management concerns: Equipment limitations, plant competition, seasonal wetness, windthrow
Management considerations:
- Because of low strength, suitable surfacing material is needed on year-round logging roads and landings.
- Equipment should be used only when the soil is relatively dry or has an adequate snow cover.
- Skidders should not be used during wet periods, when ruts form easily.
- Landing sites generally can be used only during the driest time of the year.
- Trees that can withstand seasonal wetness should be selected for planting.
- Carefully managed reforestation helps to control undesirable understory plants.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Building sites

Major management concerns: Seasonal wetness, shrink-swell
Management considerations:
- Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
- Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.
- Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Major management concerns: Restricted permeability, seasonal wetness
Management considerations:
- Filling or mounding with suitable material helps to raise the absorption field above the water table.
- A subsurface drainage system helps to lower the water table.
- Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability.
- Backfilling the trenches with porous material helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: Manary—4C; Iargo—3L
Michigan soil management group: Manary—1.5b; Iargo—1.5a

406A—Winterfield loamy sand, rarely flooded, 0 to 2 percent slopes

Setting

Landform: Flood plains
Shape of areas: Linear
Size of areas: 10 to 100 acres

Typical Profile

Surface layer:
0 to 8 inches—very dark brown loamy sand

Substratum:
8 to 18 inches—brown, mottled loamy sand
18 to 45 inches—brown, mottled sand
45 to 80 inches—grayish brown, mottled sand with strata of fine sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, at a depth of 0.5 foot to 1.5 feet at some time from October through May
Surface runoff: Very slow
Flooding: Rare
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

Winterfield soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The very poorly drained Tawas soils

Similar inclusions:
- Soils that have a darker substratum
- Soils that have a surface layer of sand

Use and Management

Dominant land use: Woodland
Other uses: Pasture

Pasture

Major management concerns: Seasonal droughtiness, seasonal wetness
Management considerations:
- Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.

• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.

Woodland

Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, plant competition, seasonal droughtiness, seasonal wetness
Management considerations:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting when the soil is moist can reduce the seedling mortality rate. Planting seedlings that can withstand droughty conditions can also reduce the seedling mortality rate. Replanting is needed in some areas.
• Trees that can withstand seasonal wetness should be selected for planting.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Building sites

Major management concerns: Cutbanks caving, seasonal wetness
Management considerations:
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.

Septic tank absorption fields

Major management concerns: Rapid permeability, seasonal wetness
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• A subsurface drainage system helps to lower the water table.

Interpretive Groups

Land capability classification: IVw
Woodland ordination symbol: 6W
Michigan soil management group: L-4c

407—Lacota loam

Setting

Landform: Lake plains and outwash plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 250 acres

Typical Profile

Surface layer:
0 to 10 inches—black loam

Subsoil:
10 to 16 inches—grayish brown, mottled, friable loam
16 to 28 inches—grayish brown, mottled, friable clay loam

Substratum:
28 to 60 inches—brown, mottled sand
60 to 80 inches—grayish brown sand

Soil Properties and Qualities

Permeability: Moderately slow in the loamy part and rapid in the sandy part
Available water capacity: Low
Drainage class: Poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from October through May
Surface runoff: Very slow or ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Moderate
Potential for frost action: High

Composition

Lacota soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Au Gres soils

Similar inclusions:
• Soils that contain more gravel in the substratum
• Soils in which the water table is at a lower depth

Use and Management

Dominant land use: Cropland
Other uses: Pasture, woodland

Cropland

Major management concerns: Seasonal wetness, low available water capacity
Management considerations:
• Most adapted crops can be grown if an adequate drainage system is installed.
• Subsurface drains can reduce the wetness if a suitable outlet is available.
• The rate of water infiltration can be increased by growing cover crops, leaving crop residue on the surface, and regularly adding other organic material.

Pasture

Major management concerns: Seasonal wetness
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.

Woodland

Major management concerns: Equipment limitations, plant competition, seasonal wetness, seedling mortality, windthrow hazard
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Building sites

Major management concerns: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 2W
Michigan soil management group: 3c

408—Sims loam

Setting

Landform: Till plains and moraines
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Surface layer:
0 to 5 inches—black loam

Subsoil:
5 to 47 inches—dark gray and gray, mottled, firm clay loam

Substratum:
47 to 80 inches—light reddish brown, mottled clay loam

Soil Properties and Qualities

Permeability: Slow
Available water capacity: High
Drainage class: Poorly drained
Seasonal high water table: Perched 1 foot above to 1 foot below the surface at some time from October through May
Surface runoff: Very slow or ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Slight
Shrink-swell potential: Moderate
Potential for frost action: High

Composition

Sims soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The poorly drained, sandy over loamy Caffey soils

Similar inclusions:
• Soils that have a surface layer of sandy loam
• Soils that have a surface layer of clay loam

Use and Management

Dominant land use: Woodland
Other uses: Pasture

Pasture

Major management concerns: Compaction, seasonal wetness
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Restricted grazing during wet periods helps to prevent compaction and poor tilth.

Woodland

Major management concerns: Equipment limitations, plant competition, seasonal wetness, seedling mortality, windthrow hazard
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• Skidders should not be used during wet periods, when ruts form easily.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Carefully managed reforestation helps to control undesirable understory plants.

Building sites

Major management concerns: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 4W
Michigan soil management group: 1.5c

409A—Finch-Deford-Au Gres complex, 0 to 3 percent slopes

Setting

Landform: Lake plains
Slope range: Finch and Au Gres—0 to 3 percent; Deford—0 to 2 percent
Shape of areas: Irregular
Size of areas: 50 to 500 acres

Typical Profile

Finch

Surface layer:
0 to 3 inches—black, well decomposed leaf litter

Subsurface layer:
3 to 6 inches—gray, mottled sand
6 to 12 inches—light brownish gray, mottled sand

Subsoil:
12 to 13 inches—dark reddish brown, strongly cemented, very firm sand
13 to 21 inches—dark reddish brown and black, strongly cemented, very firm sand
21 to 28 inches—yellowish brown, loose, mottled sand

Substratum:
28 to 36 inches—yellowish brown, mottled sand
36 to 80 inches—brown sand

Deford

Surface layer:
0 to 5 inches—black muck

Substratum:
5 to 21 inches—light brownish gray, mottled sand
21 to 42 inches—pale brown and grayish brown fine sand
42 to 80 inches—grayish brown sand

Au Gres

Surface layer:
0 to 3 inches—black, partially decomposed leaf litter

Subsurface layer:
3 to 9 inches—pinkish gray, mottled sand

Subsoil:
9 to 11 inches—dark reddish brown, mottled, very friable sand
11 to 14 inches—dark brown, mottled, very friable sand
14 to 29 inches—yellowish brown, mottled, loose sand

Substratum:
29 to 80 inches—very pale brown sand

Soil Properties and Qualities

Permeability: Finch—moderately rapid; Deford—rapid; Au Gres—rapid
Available water capacity: Low
Drainage class: Finch—somewhat poorly drained; Deford—very poorly drained; Au Gres—somewhat poorly drained
Seasonal high water table: Finch and Au Gres—apparent, at a depth of 0.5 foot to 1.5 feet at some time from October through May; Deford—apparent, 1 foot above to 1 foot below the surface at some time from October through May
Surface runoff: Finch—very slow; Deford—very slow or ponded; Au Gres—very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Finch—severe; Deford—moderate; Au Gres—severe
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

Finch soil and similar soils: 25 to 35 percent
Deford soil and similar soils: 25 to 35 percent
Au Gres soil and similar soils: 25 to 35 percent
Contrasting inclusions: 0 to 25 percent

Inclusions

Contrasting inclusions:
• The moderately well drained Proper soils
• The very poorly drained Tawas soils that have more than 16 inches of muck at the surface

Similar inclusions:
• Poorly drained soils that have a surface layer of sand
• Soils that have a lighter colored subsoil
• Soils that contain clay below a depth of 40 inches

Use and Management

Dominant land use: Woodland

Woodland

Major management concerns: Equipment limitations, windthrow hazard, plant competition, seedling mortality, seasonal wetness
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has adequate snow cover.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.
• Trees that can withstand seasonal wetness should be selected for planting on the Finch and Au Gres soils.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on the Deford soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Building sites

Major management concerns: Finch and Au Gres—cutbanks caving, seasonal wetness; Deford—ponding
Management considerations:
• Because cutbanks in areas of the Finch and Au Gres soils are not stable and are subject to caving, trench walls should be reinforced.
• In areas of the Finch and Au Gres soils, wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.
• In areas of the Finch and Au Gres soils, buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Because of ponding, the Deford soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Finch—seasonal wetness; Deford—ponding; Au Gres—rapid permeability, seasonal wetness
Management considerations:
• The poor filtering capacity of the Au Gres soil can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
• Filling or mounding with suitable fill material helps to raise the absorption field above the water table in areas of the Finch and Au Gres soils.
• Because of ponding, the Deford soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: IVw
Woodland ordination symbol: Finch—4W; Deford—4W; Au Gres—6W
Michigan soil management group: Finch—5b-h; Deford—4c; Au Gres—5b

410B—Proper-Finch-Deford complex, 0 to 6 percent slopes

Setting

Landform: Lake plains and dunes
Slope range: Proper—0 to 6 percent; Finch—0 to 3 percent; Deford—0 to 2 percent
Shape of areas: Irregular
Size of areas: 50 to 500 acres

Typical Profile

Proper

Surface layer:
0 to 2 inches—black, partially decomposed leaf litter

Subsurface layer:
2 to 5 inches—dark grayish brown sand
5 to 12 inches—grayish brown sand

Subsoil:
12 to 19 inches—dark brown, very friable sand with columns of strongly cemented sand
19 to 26 inches—brownish yellow, loose sand with columns of weakly cemented sand
26 to 40 inches—brownish yellow, mottled, loose sand with columns of weakly cemented sand

Substratum:
40 to 55 inches—pale brown, mottled sand
55 to 80 inches—light yellowish brown, mottled sand

Finch

Surface layer:
0 to 3 inches—black, well decomposed leaf litter

Subsurface layer:
3 to 6 inches—gray, mottled sand
6 to 12 inches—light brownish gray, mottled sand

Subsoil:
12 to 13 inches—dark reddish brown, strongly cemented, very firm sand
13 to 21 inches—dark reddish brown and black, strongly cemented, very firm sand
21 to 28 inches—yellowish brown, loose, mottled sand

Substratum:
28 to 36 inches—yellowish brown, mottled sand
36 to 80 inches—brown sand

Deford

Surface layer:
0 to 5 inches—black muck

Substratum:
5 to 21 inches—light brownish gray, mottled sand
21 to 42 inches—pale brown and grayish brown fine sand
42 to 80 inches—grayish brown sand

Soil Properties and Qualities

Permeability: Proper—rapid; Finch—moderately rapid; Deford—rapid
Available water capacity: Low
Drainage class: Proper—moderately well drained; Finch—somewhat poorly drained; Deford—very poorly drained
Seasonal high water table: Proper—apparent, at a depth of 2.0 to 3.5 feet at some time from November through May; Finch—apparent, at a depth of 0.5 foot to 1.5 feet at some time from October through May; Deford—apparent, 1 foot above to 1 foot below the surface at some time from October through May
Surface runoff: Proper—very slow; Finch—very slow; Deford—very slow or ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Proper—severe; Finch—severe; Deford—moderate
Shrink-swell potential: Low
Potential for frost action: Proper—low; Finch—moderate; Deford—moderate

Composition

Proper soil and similar soils: 25 to 35 percent
Finch soil and similar soils: 25 to 35 percent
Deford soil and similar soils: 25 to 35 percent
Contrasting inclusions: 0 to 25 percent

Inclusions

Contrasting inclusions:
• The excessively drained Deer Park soils
• The very poorly drained Tawas soils, which have more than 16 inches of muck at the surface

Similar inclusions:
• Poorly drained soils that have a surface layer of sand
• Soils that have a lighter colored subsoil
• Soils that contain clay below a depth of 40 inches

Use and Management

Dominant land use: Woodland

Woodland

Major management concerns: Proper—equipment limitations, plant competition, seedling mortality, seasonal droughtiness; Finch and Deford—

equipment limitations, plant competition, seedling mortality, seasonal wetness, windthrow hazard
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has adequate snow cover.
• Because loose sand can interfere with the traction of wheeled equipment, logging roads in areas of the Proper and Finch soils should be stabilized.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.
• Planting when the soil is moist can reduce the seedling mortality rate in areas of the Proper soil.
• Trees that can withstand seasonal wetness should be selected for planting on the Finch soil.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on the Deford soil.
• In areas of the Finch and Deford soils, windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Building sites

Major management concerns: Proper and Finch—cutbanks caving, seasonal wetness; Deford—ponding
Management considerations:
• Because cutbanks in areas of the Proper and Finch soils are not stable and are subject to caving, trench walls should be reinforced.
• In areas of the Proper and Finch soils, wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.
• In areas of the Proper and Finch soils, buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Because of ponding, the Deford soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Proper and Finch—seasonal wetness, rapid permeability; Deford—ponding
Management considerations:
• The poor filtering capacity of the Proper and Finch soils can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
• Filling or mounding with suitable fill material helps to raise the absorption field above the water table in areas of the Proper and Finch soils.
• Because of ponding, the Deford soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Vs
Woodland ordination symbol: Proper—5W; Finch—4W; Deford—4W
Michigan soil management group: Proper—5a-h; Finch—5b-h; Deford—4c

411A—Meehan sand, 0 to 3 percent slopes

Setting

Landform: Stream terraces, outwash plains, and beach ridges
Shape of areas: Irregular
Size of areas: 3 to 100 acres

Typical Profile

Organic mat:
0 to 1 inch—undecomposed leaf litter

Surface layer:
1 to 3 inches—very dark gray sand

Subsurface layer:
3 to 10 inches—pale brown sand

Subsoil:
10 to 22 inches—brown and yellowish brown, mottled, very friable sand
22 to 44 inches—light yellowish brown, mottled, loose sand

Substratum:
44 to 80 inches—brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: Apparent, at a depth of 1 to 3 feet at some time from October through June
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low

Potential for frost action: Moderate

Composition

Meehan soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The very poorly drained Deford soils
- The excessively drained Grayling soils

Similar inclusions:
- Soils in which the water table is at a slightly lower depth

Use and Management

Dominant land use: Woodland

Woodland

Major management concerns: Equipment limitations, plant competition, seasonal wetness, seedling mortality, windthrow hazard
Management considerations:
- The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
- Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- Trees that can withstand seasonal wetness should be selected for planting.
- Carefully managed reforestation helps to control undesirable understory plants.
- Special harvest methods may be needed to control undesirable plants.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Building sites

Major management concerns: Seasonal wetness, cutbanks caving
Management considerations:
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
- Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
- Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Rapid permeability, seasonal wetness
Management considerations:
- The poor filtering capacity of this soil can result in the pollution of ground water.
- Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
- Filling or mounding with suitable material helps to raise the absorption field above the water table.
- A subsurface drainage system helps to lower the water table.

Interpretive Groups

Land capability classification: IVw
Woodland ordination symbol: 5W
Michigan soil management group: 5b

425D—Hottis sandy loam, 12 to 18 percent slopes

Setting

Landform: Till plains and moraines
Shape of areas: Linear
Size of areas: 5 to 25 acres

Typical Profile

Surface layer:
0 to 5 inches—very dark gray sandy loam

Subsurface layer:
5 to 9 inches—brown sandy loam and dark yellowish brown sandy loam

Subsoil:
9 to 13 inches—brown, firm clay and brown, firm sandy loam
13 to 33 inches—strong brown, firm clay
33 to 80 inches—brown, firm clay

Soil Properties and Qualities

Permeability: Slow
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Rapid
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Moderate

Shrink-swell potential: High
Potential for frost action: High

Composition

Hottis soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
• The well drained, sandy over loamy Menominee soils

Similar inclusions:
• Soils that have a sandy substratum
• Soils that have less clay in the subsoil
• Soils that have a surface layer of clay loam

Use and Management

Dominant land use: Woodland
Other uses: Pasture

Pasture

Major management concerns: Compaction
Management considerations:
• Proper stocking rates, uniform distribution of grazing, and a planned grazing system help to keep the pasture in good condition.

Woodland

Major management concerns: Plant competition, equipment limitations, windthrow hazard
Management considerations:
• Carefully managed reforestation helps to control undesirable understory plants.
• If trees are planted, site preparation is needed to control competing vegetation. Subsequent control of the invasion and growth of hardwoods may be needed.
• Because of the restricted permeability and the sticky and plastic subsoil, logging roads should be graveled and in some areas landings should be stabilized.
• The grade should be kept as low as possible.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Building sites

Major management concerns: Shrink-swell, slope
Management considerations:
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.
• Because of the slope, this soil is poorly suited to building site development unless extensive land shaping is feasible.

Septic tank absorption fields

Major management concerns: Restricted permeability, slope
Management considerations:
• Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 3C
Michigan soil management group: 1a

426B—Coppler loamy sand, 0 to 6 percent slopes

Setting

Landform: Stream terraces and outwash channels
Shape of areas: Irregular or linear
Size of areas: 10 to 50 acres

Typical Profile

Surface layer:
0 to 5 inches—very dark gray loamy sand

Subsoil:
5 to 17 inches—yellowish brown, very friable loamy sand
17 to 24 inches—yellowish brown, very friable gravelly sand
24 to 29 inches—dark brown, friable very gravelly sandy loam

Substratum:
29 to 80 inches—pale brown very gravelly sand

Soil Properties and Qualities

Permeability: Moderately rapid in the upper part and very rapid in the lower part
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Coppler soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The excessively drained Grayling soils
- The somewhat poorly drained Gladwin soils

Similar inclusions:
- Soils that contain less gravel in the substratum

Use and Management

Dominant land use: Woodland

Woodland

Major management concerns: None

Building sites

Major management concerns: Cutbanks caving
Management considerations:
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.

Septic tank absorption fields

Major management concerns: Rapid permeability
- The poor filtering capacity of this soil can result in the pollution of ground water.
- Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: 3A
Michigan soil management group: 4a

426C—Coppler loamy sand, 6 to 12 percent slopes

Setting

Landform: Stream terraces
Shape of areas: Irregular or linear
Size of areas: 5 to 25 acres

Typical Profile

Surface layer:
0 to 5 inches—very dark gray loamy sand

Subsoil:
5 to 17 inches—yellowish brown, very friable loamy sand
17 to 24 inches—yellowish brown, very friable gravelly sand
24 to 29 inches—dark brown, friable very gravelly sandy loam

Substratum:
29 to 80 inches—pale brown very gravelly sand

Soil Properties and Qualities

Permeability: Moderately rapid in the upper part and very rapid in the lower part
Available water capacity: Low
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Slow
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Coppler soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Gladwin soils
- The excessively drained Grayling soils

Similar inclusions:
- Soils that contain less gravel in the substratum

Use and Management

Dominant land use: Woodland

Woodland

Major management concerns: None

Building sites

Major management concerns: Cutbanks caving, slope
Management considerations:
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
- Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.

Septic tank absorption fields

Major management concerns: Slope, rapid permeability
Management considerations:
- Land shaping and installing the distribution lines on the contour help to overcome the slope.

• The poor filtering capacity of this soil can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 3A
Michigan soil management group: 4a

427—Tonkey sandy loam

Setting

Landform: Till plains and outwash plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Surface layer:
0 to 7 inches—black sandy loam

Subsoil:
7 to 9 inches—grayish brown, very friable loamy sand
9 to 12 inches—light brownish gray, mottled, very friable sandy loam
12 to 17 inches—light yellowish brown, mottled, firm sandy clay loam

Substratum:
17 to 80 inches—light yellowish brown, pale brown, light brownish gray, and gray, mottled, stratified fine sand, very fine sand, loam, and silt loam

Soil Properties and Qualities

Permeability: Moderately rapid
Available water capacity: Moderate
Drainage class: Poorly drained
Seasonal high water table: Apparent, 1 foot above to 1 foot below the surface at some time from October through May
Surface runoff: Very slow or ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: High

Composition

Tonkey soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The very poorly drained Deford soils
• The somewhat poorly drained Ingalls soils

Similar inclusions:
• Soils that have a surface layer of loam

Use and Management

Dominant land use: Woodland

Woodland

Major management concerns: Equipment limitations, plant competition, seasonal wetness, seedling mortality, windthrow hazard
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Carefully managed reforestation helps to control undesirable understory plants.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on this soil.

Building sites

Major management concerns: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Ponding
Management considerations:
• Because of ponding, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 5W
Michigan soil management group: 3c-s

429D—Menominee sand, 12 to 18 percent slopes

Setting

Landform: Till plains and moraines
Shape of areas: Linear
Size of areas: 5 to 50 acres

Typical Profile

Surface layer:
0 to 4 inches—very dark grayish brown sand

Subsurface layer:
4 to 7 inches—grayish brown sand

Subsoil:
7 to 18 inches—dark brown, very friable sand
18 to 23 inches—dark yellowish brown, very friable sand
23 to 39 inches—brown, firm clay loam and light brownish gray sandy loam
39 to 59 inches—reddish brown, firm clay loam

Substratum:
59 to 80 inches—brown loam

Soil Properties and Qualities

Permeability: Rapid in the sandy part and moderately slow in the loamy part
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Severe
Shrink-swell potential: Moderate
Potential for frost action: Low

Composition

Menominee soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The well drained, loamy Curtisville soils

Similar inclusions:
- Soils that have clay loam till at a depth of more than 40 inches
- Soils that have a lighter colored subsoil

Use and Management

Dominant land use: Woodland

Woodland

Major management concerns: Equipment limitations, seedling mortality, plant competition, seasonal droughtiness
Management considerations:
- The grade should be kept as low as possible.
- Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- Planting when the soil is moist can reduce the seedling mortality rate.
- Carefully managed reforestation helps to control undesirable understory plants.

Building sites

Major management concerns: Cutbanks caving, slope
Management considerations:
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
- Because of the slope, this soil is poorly suited to building site development unless extensive land shaping is feasible.

Septic tank absorption fields

Major management concerns: Rapid permeability, slope, restricted permeability
Management considerations:
- The poor filtering capacity of this soil can result in the pollution of ground water.
- Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
- Land shaping and installing the distribution lines on the contour help to overcome the slope.
- Backfilling the trenches with porous material helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 6S
Michigan soil management group: 4/2a

430D—Mongo loam, 12 to 18 percent slopes

Setting

Landform: Dissected lake plains
Shape of areas: Linear
Size of areas: 10 to 50 acres

Typical Profile

Surface layer:
0 to 5 inches—very dark grayish brown loam

Subsoil:
5 to 8 inches—dark brown, firm silty clay and light brownish gray, firm silty clay loam
8 to 12 inches—dark brown, firm silty clay and brown, firm silty clay loam

12 to 21 inches—dark brown, firm silty clay
21 to 55 inches—brown, firm silty clay loam

Substratum:
55 to 80 inches—stratified brown and reddish brown silty clay loam

Soil Properties and Qualities

Permeability: Very slow
Available water capacity: High
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Rapid
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Slight
Shrink-swell potential: High
Potential for frost action: Moderate

Composition

Mongo soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained, sandy over clayey Allendale soils
- The moderately well drained Negwegon soils

Similar inclusions:
- Soils that have a surface layer of clay loam
- Soils that have a surface layer of sandy loam

Use and Management

Dominant land use: Pasture
Other uses: Woodland

Pasture

Major management concerns: Compaction
Management considerations:
- Proper stocking rates, uniform distribution of grazing, and a planned grazing system help to keep the pasture in good condition.
- Restricted grazing during wet periods helps to prevent compaction and poor tilth.

Woodland

Major management concerns: Erosion hazard, equipment limitations, plant competition, slope, windthrow hazard
Management considerations:
- Because of the restricted permeability and the sticky and plastic subsoil, logging roads should be graveled and in some areas landings should be stabilized.
- The grade should be kept as low as possible.
- Carefully managed reforestation helps to control undesirable understory plants.
- Special harvest methods may be needed to control undesirable plants.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Building sites

Major management concerns: Shrink-swell, slope
Management considerations:
- Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.
- Because of the slope, this soil is poorly suited to building site development unless extensive land shaping is feasible.

Septic tank absorption fields

Major management concerns: Restricted permeability, slope
Management considerations:
- Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability.
- Backfilling the trenches with porous material helps to compensate for the restricted permeability.
- Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 3R
Michigan soil management group: 1a

430E—Mongo loam, 18 to 35 percent slopes

Setting

Landform: Lake plains
Shape of areas: Linear
Size of areas: 5 to 40 acres

Typical Profile

Surface layer:
0 to 5 inches—very dark grayish brown loam

Subsoil:
5 to 8 inches—dark brown, firm silty clay and light brownish gray, firm silty clay loam
8 to 12 inches—dark brown, firm silty clay and brown, firm silty clay loam

12 to 21 inches—dark brown, firm silty clay
21 to 55 inches—brown, firm silty clay loam

Substratum:
55 to 80 inches—stratified brown and reddish brown silty clay loam

Soil Properties and Qualities

Permeability: Very slow
Available water capacity: High
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Very rapid
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Slight
Shrink-swell potential: High
Potential for frost action: Moderate

Composition

Mongo soil and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained, sandy over clayey Allendale soils
- The moderately well drained Negwegon soils

Similar inclusions:
- Soils that have a surface layer of clay loam
- Soils that have a surface layer of sandy loam

Use and Management

Dominant land use: Pasture
Other uses: Woodland

Pasture

Major management concerns: Compaction
Management considerations:
- Proper stocking rates, uniform distribution of grazing, and a planned grazing system help to keep the pasture in good condition.
- Restricted grazing during wet periods helps to prevent compaction and poor tilth.

Woodland

Major management concerns: Erosion hazard, equipment limitations, plant competition, slope, windthrow hazard
Management considerations:
- Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
- The grade should be kept as low as possible.
- Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
- Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures. Building logging roads on the contour or on the gentler slopes and seeding logging roads, skid roads, and landings after the trees are logged also help to prevent excessive soil loss.
- Because of the restricted permeability and the sticky and plastic subsoil, logging roads should be graveled and in some areas landings should be stabilized.
- Carefully managed reforestation helps to control undesirable understory plants.
- Special harvest methods may be needed to control undesirable plants.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Building sites

Major management concerns: Slope
Management considerations:
- Because of the slope, this soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Slope
Management considerations:
- Because of the slope, this soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3R
Michigan soil management group: 1a

431B—Skeel loamy sand, 0 to 6 percent slopes

Setting

Landform: Lake plains
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Surface layer:
0 to 8 inches—very dark grayish brown loamy sand

Subsurface layer:
8 to 11 inches—light brownish gray sand

Subsoil:
11 to 18 inches—brown, loose sand with columns of brown and very dark brown, weakly cemented to strongly cemented sand
18 to 29 inches—strong brown, mottled, loose sand with columns of weakly cemented to moderately cemented sand
29 to 36 inches—yellowish brown, mottled, loose sand
36 to 45 inches—reddish brown, mottled, firm clay loam

Substratum:
45 to 80 inches—brown, mottled clay loam

Soil Properties and Qualities

Permeability: Rapid in the sandy part and moderately slow in the loamy part
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Perched at a depth of 2.0 to 3.5 feet at some time from November through May
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Moderate
Potential for frost action: Low

Composition

Skeel soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Manary soils
- The poorly drained Springport soils

Similar inclusions:
- Soils that have a lighter colored subsoil
- Soils in which the subsoil is at a lower depth

Use and Management

Dominant land use: Cropland
Other uses: Pasture; woodland

Cropland

Major management concerns: Seasonal droughtiness, soil blowing
Management considerations:
- Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing. Maintaining a permanent plant cover also helps to control soil blowing.
- Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.
- A system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture and in reducing the hazard of soil blowing.

Pasture

Major management concerns: Overgrazing, seasonal droughtiness
Management considerations:
- Proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
- Applying lime and fertilizer according to soil tests can help to ensure the maximum growth of plants, especially legumes.

Woodland

Major management concerns: Equipment limitations, plant competition, seasonal droughtiness, seedling mortality
Management considerations:
- Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- Planting when the soil is moist can reduce the seedling mortality rate. Planting seedlings that can withstand droughty conditions can also reduce the seedling mortality rate. Replanting is needed in some areas.
- Special harvest methods may be needed to control undesirable plants.
- Carefully managed reforestation helps to control undesirable understory plants.

Building sites

Major management concerns: Cutbanks caving, seasonal wetness, shrink-swell
Management considerations:
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
- Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
- Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.

• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Major management concerns: Restricted permeability, seasonal wetness
Management considerations:
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• A subsurface drainage system helps to lower the water table.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: 3S
Michigan soil management group: 4/2a

432B—Wurtsmith-Meehan sands, 0 to 6 percent slopes

Setting

Landform: Beach ridges on lake plains
Slope range: Wurtsmith—0 to 6 percent; Meehan—0 to 3 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Wurtsmith

Surface layer:
0 to 1 inch—black, partially decomposed leaf litter

Subsurface layer:
1 to 4 inches—grayish brown sand

Subsoil:
4 to 14 inches—yellowish brown, very friable sand
14 to 24 inches—brownish yellow, very friable sand

Substratum:
24 to 80 inches—pale brown and brown, mottled sand

Meehan

Surface layer:
0 to 2 inches—very dark gray sand

Subsurface layer:
2 to 9 inches—pale brown sand

Subsoil:
9 to 21 inches—brown and yellowish brown, mottled, very friable sand
21 to 43 inches—light yellowish brown, mottled, loose sand

Substratum:
43 to 80 inches—brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Wurtsmith—moderately well drained; Meehan—somewhat poorly drained
Seasonal high water table: Wurtsmith—apparent, at a depth of 2.0 to 3.5 feet at some time from November through May; Meehan—apparent, at a depth of 1 to 3 feet at some time from October through June
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Wurtsmith—low; Meehan—moderate

Composition

Wurtsmith soil and similar soils: 40 to 50 percent
Meehan soil and similar soils: 30 to 40 percent
Contrasting inclusions: 10 to 25 percent

Inclusions

Contrasting inclusions:
• The very poorly drained Deford soils
• The excessively drained Grayling soils

Similar inclusions:
• Soils that have a darker subsoil

Use and Management

Dominant land use: Woodland

Woodland

Major management concerns: Wurtsmith—equipment limitations, seedling mortality, windthrow hazard, seasonal droughtiness; Meehan—equipment limitations, seedling mortality, windthrow hazard, plant competition, seasonal wetness
Management considerations:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate in areas of the Wurtsmith soil. Replanting is needed in some areas.

• Planting when the soil is moist can reduce the seedling mortality rate in areas of the Wurtsmith soil.
• In areas of the Meehan soil, the seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Trees that can withstand seasonal wetness should be selected for planting on the Meehan soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Carefully managed reforestation helps to control undesirable understory plants in areas of the Meehan soil.
• Special harvest methods may be needed to control undesirable plants in areas of the Meehan soil.

Building sites

Major management concerns: Seasonal wetness, cutbanks caving
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Rapid permeability, seasonal wetness
Management considerations:
• The poor filtering capacity of these soils can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: Wurtsmith—6S; Meehan—5W
Michigan soil management group: Wurtsmith—5a; Meehan—5b

433B—Morganlake-Graycalm sands, 0 to 6 percent slopes

Setting

Landform: Till plains
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Morganlake

Surface layer:
0 to 4 inches—black sand

Subsurface layer:
4 to 6 inches—light brownish gray sand

Subsoil:
6 to 13 inches—dark brown, friable sand
13 to 23 inches—brown, very friable sand
23 to 29 inches—light brownish gray, mottled, very friable loamy sand
29 to 47 inches—dark brown, mottled, firm clay loam and pinkish gray, very friable sandy loam

Substratum:
47 to 80 inches—reddish brown, mottled clay loam

Graycalm

Surface layer:
0 to 4 inches—black sand

Subsoil:
4 to 16 inches—strong brown, friable sand
16 to 45 inches—yellowish brown, brownish yellow, and yellow, very friable sand

Substratum:
45 to 80 inches—very pale brown sand with bands of strong brown loamy sand

Soil Properties and Qualities

Permeability: Morganlake—rapid in the sandy part and moderately slow in the loamy part; Graycalm—rapid
Available water capacity: Morganlake—moderate; Graycalm—low
Drainage class: Morganlake—moderately well drained; Graycalm—somewhat excessively drained
Seasonal high water table: Morganlake—perched at a depth of 2.0 to 3.5 feet at some time from October through May; Graycalm—at a depth of more than 6 feet
Surface runoff: Very slow

Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Morganlake—moderate; Graycalm—low
Potential for frost action: Morganlake—moderate; Graycalm—low

Composition

Morganlake soil and similar soils: 40 to 50 percent
Graycalm soil and similar soils: 40 to 50 percent
Contrasting inclusions: 0 to 20 percent

Inclusions

Contrasting inclusions:
• The moderately well drained, loamy Nester soils

Similar inclusions:
• Soils that do not have bands of loamy sand in the substratum
• Soils that have a lighter colored subsoil

Use and Management

Dominant land use: Woodland

Woodland

Major management concerns: Morganlake—equipment limitations, seedling mortality, seasonal droughtiness, plant competition; Graycalm—equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings or planting seedlings that can withstand droughty conditions can also reduce the seedling mortality rate. Replanting is needed in some areas.
• Carefully managed reforestation helps to control undesirable understory plants in areas of the Morganlake soil.
• Special harvest methods may be needed in areas of the Morganlake soil to control undesirable plants.

Building sites

Major management concerns: Morganlake—cutbanks caving, seasonal wetness, shrink-swell; Graycalm—cutbanks caving
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• In areas of the Morganlake soil, buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• In areas of the Morganlake soil, wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling of the Morganlake soil.

Septic tank absorption fields

Major management concerns: Morganlake—rapid permeability, restricted permeability, seasonal wetness; Graycalm—rapid permeability
Management considerations:
• The poor filtering capacity of these soils can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability in the lower part of the Morganlake soil.
• Filling or mounding with suitable material helps to raise the absorption field above the water table in areas of the Morganlake soil.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: 6S
Michigan soil management group: Morganlake—4/2a; Graycalm—5a

434D—Graycalm-Menominee-Morganlake sands, 6 to 18 percent slopes

Setting

Landform: Till plains
Slope range: Graycalm—6 to 18 percent; Menominee—12 to 18 percent; Morganlake—6 to 12 percent
Shape of areas: Irregular
Size of areas: 25 to 200 acres

Typical Profile

Graycalm

Surface layer:
0 to 4 inches—black sand

Subsoil:
4 to 16 inches—strong brown, friable sand

16 to 45 inches—yellowish brown, brownish yellow, and yellow, very friable sand

Substratum:
45 to 80 inches—very pale brown sand with bands of strong brown loamy sand

Menominee

Surface layer:
0 to 4 inches—very dark grayish brown sand

Subsurface layer:
4 to 7 inches—grayish brown sand

Subsoil:
7 to 23 inches—dark brown and dark yellowish brown, very friable sand
23 to 39 inches—brown, firm clay and light brownish gray sandy loam
39 to 59 inches—reddish brown, firm clay loam

Substratum:
59 to 80 inches—brown loam

Morganlake

Surface layer:
0 to 4 inches—black sand

Subsurface layer:
4 to 6 inches—light brownish gray sand

Subsoil:
6 to 13 inches—dark brown, friable sand
13 to 23 inches—brown, very friable sand
23 to 29 inches—light brownish gray loamy sand
29 to 47 inches—dark brown, firm, mottled clay loam and pinkish gray, very friable sandy loam

Substratum:
47 to 80 inches—reddish brown, mottled clay loam

Soil Properties and Qualities

Permeability: Graycalm—rapid; Menominee and Morganlake—rapid in the sandy part and moderately slow in the loamy part
Available water capacity: Graycalm—low; Menominee and Morganlake—moderate
Drainage class: Graycalm—somewhat excessively drained; Menominee—well drained; Morganlake—moderately well drained
Seasonal high water table: Graycalm and Menominee—at a depth of more than 6 feet; Morganlake—perched at a depth of 2.0 to 3.5 feet at some time from October through May
Surface runoff: Graycalm and Menominee—medium; Morganlake—slow
Flooding: None
Hazard of water erosion: Graycalm and Morganlake—moderate; Menominee—severe
Hazard of soil blowing: Severe
Shrink-swell potential: Graycalm—low; Menominee and Morganlake—moderate
Potential for frost action: Low

Composition

Graycalm soil and similar soils: 30 to 40 percent
Menominee soil and similar soils: 25 to 35 percent
Morganlake soil and similar soils: 25 to 35 percent
Contrasting inclusions: 0 to 20 percent

Inclusions

Contrasting inclusions:
- The moderately well drained, loamy Nester soils

Similar inclusions:
- Soils that do not have bands of loamy sand in the substratum
- Soils that have a lighter colored subsoil

Use and Management

Dominant land use: Woodland

Woodland

Major management concerns: Graycalm—equipment limitations, seedling mortality, seasonal droughtiness, erosion hazard; Menominee and Morganlake—equipment limitations, seedling mortality, seasonal droughtiness, plant competition
Management considerations:
- Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- Planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings or planting seedlings that can withstand droughty conditions can also reduce the seedling mortality rate. Replanting is needed in some areas.
- In areas of the Graycalm soil, the risk of erosion can be reduced by seeding logging roads, landings, and areas that have been cut and filled and by installing water bars and culverts.
- Carefully managed reforestation helps to control undesirable understory plants in areas of the Menominee and Morganlake soils.
- Special harvest methods may be needed to control undesirable plants in areas of the Menominee and Morganlake soils.

Building sites

Major management concerns: Graycalm and Menominee—cutbanks caving, slope;

Morganlake—cutbanks caving, slope, seasonal wetness, shrink-swell

Management considerations:

• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.

• Because of the slope, these soils are poorly suited to building site development unless extensive land shaping is feasible.

• In areas of the Morganlake soil, buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.

• In areas of the Morganlake soil, wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.

• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling of the Morganlake soil.

Septic tank absorption fields

Major management concerns: Graycalm—rapid permeability, slope; Menominee—rapid permeability, slope, restricted permeability; Morganlake—rapid permeability, slope, restricted permeability, seasonal wetness

Management considerations:

• The poor filtering capacity of these soils can result in the pollution of ground water.

• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.

• Land shaping and installing the distribution lines on the contour help to overcome the slope.

• Backfilling the trenches with porous material helps to compensate for the restricted permeability in the lower part of the Menominee and Morganlake soils.

• Filling or mounding with suitable material helps to raise the absorption field above the water table in areas of the Morganlake soil.

Interpretive Groups

Land capability classification: VIs

Woodland ordination symbol: 6S

Michigan soil management group: Graycalm—5a; Menominee—4/2a; Morganlake—4/2a

435B—Skeel-Algonquin-Aquepts complex, 0 to 6 percent slopes

Setting

Landform: Lake plains

Slope range: Skeel—0 to 6 percent; Algonquin—0 to 3 percent; Aquepts—0 to 2 percent

Shape of areas: Irregular

Size of areas: 10 to 200 acres

Typical Profile

Skeel

Surface layer:

0 to 8 inches—very dark grayish brown loamy sand

Subsurface layer:

8 to 11 inches—light brownish gray sand

Subsoil:

11 to 18 inches—brown, loose sand with columns of brown and very dark brown, weakly cemented to strongly cemented sand

18 to 29 inches—strong brown, mottled, loose sand with columns of weakly cemented to moderately cemented sand

29 to 36 inches—yellowish brown, mottled, loose sand

36 to 45 inches—reddish brown, mottled, firm clay loam

Substratum:

45 to 80 inches—brown, mottled clay loam

Algonquin

Surface layer:

0 to 9 inches—very dark grayish brown clay

Subsoil:

9 to 17 inches—brown and reddish brown, mottled, firm clay

Substratum:

17 to 80 inches—reddish brown, mottled clay

Aquepts

Surface layer:

0 to 8 inches—black sandy loam

Subsoil:

8 to 30 inches—grayish brown, friable clay loam

Substratum:

30 to 80 inches—light brownish gray clay loam

Soil Properties and Qualities

Permeability: Skeel—rapid in the sandy part and moderately slow in the loamy part; Algonquin—very slow; Aquepts—moderate

Available water capacity: Moderate

Drainage class: Skeel—moderately well drained; Algonquin—somewhat poorly drained; Aquepts—very poorly drained

Seasonal high water table: Skeel—perched at a depth of 2.0 to 3.5 feet at some time from November through May; Algonquin—perched at a depth of 0.5 foot to 1.5 feet at some time from October

through May; Aquepts—perched at the surface to 1 foot above the surface at some time from January through December
Surface runoff: Skeel—very slow; Algonquin—slow; Aquepts—ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Skeel—moderate; Algonquin—high; Aquepts—moderate
Potential for frost action: Skeel—low; Algonquin and Aquepts—high

Composition

Skeel soil and similar soils: 30 to 40 percent
Algonquin soil and similar soils: 30 to 40 percent
Aquepts and similar soils: 20 to 30 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
- The very poorly drained, sandy over clayey Wakeley soils
- The clayey, moderately well drained Iargo soils

Similar inclusions:
- Soils that do not have cementation in the subsoil
- Soils that have a surface layer of sand

Use and Management

Dominant land use: Pasture
Other uses: Woodland

Pasture

Major management concerns: Skeel—overgrazing, seasonal droughtiness; Algonquin—compaction, seasonal wetness; Aquepts—ponding
Management considerations:
- In areas of the Skeel soil, proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
- In areas of the Algonquin soil, proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
- Hay and pasture plants that can withstand periodic inundation and seasonal wetness should be seeded in areas of the Algonquin soil.
- Restricted grazing during wet periods helps to prevent compaction and poor tilth in areas of the Algonquin soil.

Woodland

Major management concerns: Skeel—equipment limitations, seedling mortality, plant competition, seasonal droughtiness; Algonquin—equipment limitations, seedling mortality, plant competition, windthrow hazard, seasonal wetness; Aquepts—equipment limitations, seedling mortality, plant competition, seasonal wetness
Management considerations:
- Because loose sand in areas of the Skeel soil can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- Because of the restricted permeability and the sticky and plastic subsoil of the Algonquin soil, logging roads should be graveled and in some areas landings should be stabilized.
- Planting when the soil is moist can reduce the seedling mortality rate in areas of the Skeel soil.
- Trees that can withstand seasonal wetness should be selected for planting on the Algonquin soil.
- Carefully managed reforestation helps to control undesirable understory plants.
- Special harvest methods may be needed to control undesirable plants.
- In areas of the Algonquin soil, windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
- Because of wetness, seedling mortality, and plant competition, trees are generally not planted on the Aquepts.

Building sites

Major management concerns: Skeel—cutbanks caving, seasonal wetness, shrink-swell; Algonquin—seasonal wetness, shrink-swell; Aquepts—ponding
Management considerations:
- Because cutbanks in areas of the Skeel soil are not stable and are subject to caving, trench walls should be reinforced.
- In areas of the Skeel and Algonquin soils, buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
- Wetness in areas of the Skeel and Algonquin soils can be reduced by installing a drainage system around structures with basements and crawl spaces.
- Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling of the Skeel and Algonquin soils.
- Because of ponding, the Aquepts are generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Skeel—seasonal wetness, restricted permeability; Algonquin—

seasonal wetness, restricted permeability; Aquepts—ponding

Management considerations:

- Filling or mounding with suitable material helps to raise the absorption field above the water table in areas of the Skeel and Algonquin soils.
- Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability of the Skeel and Algonquin soils.
- Backfilling the trenches with porous material helps to compensate for the restricted permeability of the Skeel and Algonquin soils.
- Because of ponding, the Aquepts are generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: Skeel—3S; Algonquin—6W; Aquepts—none assigned
Michigan soil management group: Skeel—4/2a; Algonquin—1b; Aquepts—none assigned

436A—Manary-Whittemore-Springport complex, 0 to 3 percent slopes

Setting

Landform: Lake plains
Slope range: Manary and Whittemore—0 to 3 percent; Springport—0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Manary

Surface layer:
0 to 11 inches—black silty clay loam

Subsoil:
11 to 18 inches—brown, mottled, firm silty clay

Substratum:
18 to 29 inches—reddish brown, mottled silty clay loam
29 to 80 inches—brown and reddish brown silty clay loam with strata of brown and pale brown loamy very fine sand

Whittemore

Surface layer:
0 to 9 inches—very dark gray sand

Subsurface layer:
9 to 12 inches—light grayish brown and light gray sand

Subsoil:
12 to 17 inches—dark reddish brown, mottled, strongly cemented, firm sand
17 to 35 inches—yellowish brown and light yellowish brown, mottled, loose sand
35 to 44 inches—light reddish brown, mottled, firm silty clay

Substratum:
44 to 80 inches—reddish brown, mottled silty clay

Springport

Surface layer:
0 to 10 inches—very dark gray silty clay loam

Subsoil:
10 to 36 inches—dark gray, mottled, firm silty clay loam

Substratum:
36 to 80 inches—reddish brown, mottled silty clay loam and silt loam

Soil Properties and Qualities

Permeability: Manary—slow; Whittemore—moderate in the sandy part and very slow in the clayey part; Springport—very slow
Available water capacity: Manary—moderate; Whittemore—low; Springport—high
Drainage class: Manary and Whittemore—somewhat poorly drained; Springport—poorly drained
Seasonal high water table: Manary and Whittemore—perched at a depth of 0.5 foot to 1.5 feet at some time from October through May; Springport—perched 1 foot above to 1 foot below the surface at some time from October through June
Surface runoff: Manary—slow; Whittemore—very slow; Springport—very slow or ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Manary—moderate; Whittemore—severe; Springport—slight
Shrink-swell potential: High
Potential for frost action: Manary—high; Whittemore—moderate; Springport—high

Composition

Manary soil and similar soils: 30 to 40 percent
Whittemore soil and similar soils: 30 to 40 percent
Springport soil and similar soils: 20 to 30 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:

- The moderately poorly drained Iargo soils
- The moderately well drained Skeel soils

• The very poorly drained Tawas soils

Similar inclusions:
• Sandy soils that have a lighter colored subsoil
• Soils that have a mucky surface layer
• Sandy soils that do not have cementation in the subsoil

Use and Management

Dominant land use: Woodland
Other uses: Cropland, pasture

Cropland

Major management concerns: Manary—seasonal wetness, restricted permeability; Whittemore—seasonal wetness, restricted permeability, soil blowing, nutrient and pesticide loss; Springport—seasonal wetness, restricted permeability, tilth of the surface layer, soil compaction
Management considerations:
• Subsurface drains can reduce the wetness if a suitable outlet is available.
• Because of the restricted permeability, subsurface drains should be narrowly spaced.
• Shallow surface ditches help to remove surface water after heavy rains.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.
• Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing in areas of the Whittemore soil. Maintaining a permanent plant cover also helps to control soil blowing.
• Because of the risk of ground-water pollution in areas of the Whittemore soil, nutrients in manure and fertilizer applications should not exceed the requirements of the plants.

Pasture

Major management concerns: Manary and Whittemore—seasonal wetness; Springport—seasonal wetness, compaction
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Restricted grazing during wet periods helps to prevent compaction and poor tilth.

Woodland

Major management concerns: Equipment limitations, plant competition, seedling mortality, windthrow hazard, seasonal wetness
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has adequate snow cover.
• Trees that can withstand seasonal wetness should be selected for planting on the Manary and Whittemore soils.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on the Springport soil.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Building sites

Major management concerns: Manary—seasonal wetness, shrink-swell; Whittemore—cutbanks caving, seasonal wetness, shrink-swell; Springport—ponding
Management considerations:
• Because cutbanks in areas of the Whittemore soil are not stable and are subject to caving, trench walls should be reinforced.
• In areas of the Manary and Whittemore soils, buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness in areas of the Manary and Whittemore soils can be reduced by installing a drainage system around structures with basements and crawl spaces.
• In areas of the Manary and Whittemore soils, properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.
• Because of ponding, the Springport soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Manary—seasonal wetness, restricted permeability; Whittemore—seasonal wetness, rapid permeability, restricted permeability; Springport—ponding
Management considerations:
• The poor filtering capacity of the Whittemore soil can result in the pollution of ground water.

- Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
- In areas of the Manary and Whittemore soils, filling or mounding with suitable fill material helps to raise the absorption field above the water table.
- Backfilling the trenches with porous material helps to compensate for the restricted permeability in the Manary soil and in the lower part of the Whittemore soil.
- Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability in the Manary soil and in the lower part of the Whittemore soil.
- Because of ponding, the Springport soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: Manary—4C; Whittemore—4W; Springport—6W
Michigan soil management group: Manary—1.5b; Whittemore—5/2b; Springport—1c

437D—Wurtsmith-Meehan-Deer Park sands, 0 to 18 percent slopes

Setting

Landform: Beach ridges on lake plains
Slope range: Wurtsmith—0 to 12 percent; Meehan—0 to 3 percent; Deer Park—6 to 18 percent
Shape of areas: Irregular or linear
Size of areas: 20 to 300 acres

Typical Profile

Wurtsmith

Surface layer:
0 to 1 inch—black, partially decomposed leaf litter

Subsurface layer:
1 to 4 inches—grayish brown sand

Subsoil:
4 to 14 inches—yellowish brown, very friable sand
14 to 24 inches—brownish yellow, mottled, very friable sand

Substratum:
24 to 80 inches—pale brown and brown sand

Meehan

Surface layer:
0 to 2 inches—very dark gray sand

Subsurface layer:
2 to 9 inches—pale brown sand

Subsoil:
9 to 43 inches—brown, yellowish brown, and light yellowish brown, mottled, very friable sand

Substratum:
43 to 80 inches—brown sand

Deer Park

Surface layer:
0 to 1 inch—black, well decomposed leaf litter

Subsurface layer:
1 to 6 inches—gray sand

Subsoil:
6 to 10 inches—dark yellowish brown, very friable sand
10 to 18 inches—light yellowish brown, yellowish brown, and brownish yellow, very friable sand

Substratum:
18 to 80 inches—pale brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Wurtsmith—moderately well drained; Meehan—somewhat poorly drained; Deer Park—excessively drained
Seasonal high water table: Wurtsmith—apparent, at a depth of 2.0 to 3.5 feet at some time from November through May; Meehan—apparent, at a depth of 1 to 3 feet at some time from October through June; Deer Park—at a depth of more than 6 feet
Surface runoff: Wurtsmith—very slow or slow; Meehan—very slow; Deer Park—medium
Flooding: None
Hazard of water erosion: Wurtsmith and Meehan—slight; Deer Park—moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Wurtsmith—low; Meehan—moderate; Deer Park—low

Composition

Wurtsmith soil and similar soils: 30 to 40 percent
Meehan soil and similar soils: 30 to 40 percent
Deer Park soil and similar soils: 25 to 30 percent
Contrasting inclusions: 15 to 25 percent

Inclusions

Contrasting inclusions:
- The very poorly drained Deford soils

Similar inclusions:
• Soils that have a darker subsoil

Use and Management

Dominant land use: Woodland

Woodland

Major management concerns: Wurtsmith—equipment limitations, seedling mortality, seasonal droughtiness; Meehan—equipment limitations, seedling mortality, seasonal wetness, plant competition, windthrow hazard; Deer Park—equipment limitations, seedling mortality, seasonal droughtiness, slope
Management considerations:
• Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate in areas of the Wurtsmith and Deer Park soils. Replanting is needed in some areas.
• Planting when the soil is moist can reduce the seedling mortality rate in areas of the Wurtsmith and Deer Park soils.
• In areas of the Meehan soil, the seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Trees that can withstand seasonal wetness should be selected for planting on the Meehan soil.
• In areas of the Meehan soil, windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Carefully managed reforestation helps to control undesirable understory plants in areas of the Meehan soil.
• Special harvest methods may be needed to control undesirable plants in areas of the Meehan soil.

Building sites

Major management concerns: Wurtsmith and Meehan—cutbanks caving, seasonal wetness; Deer Park—cutbanks caving
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Buildings in areas of the Wurtsmith and Meehan soils can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness in areas of the Wurtsmith and Meehan soils can be reduced by installing a drainage system around structures with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Wurtsmith and Meehan—rapid permeability, seasonal wetness; Deer Park—rapid permeability
Management considerations:
• The poor filtering capacity of these soils can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
• Filling or mounding with suitable material helps to raise the absorption field above the water table in areas of the Wurtsmith and Meehan soils.

Interpretive Groups

Land capability classification: IVs
Woodland ordination symbol: Wurtsmith—6S; Meehan—5W; Deer Park—4S
Michigan soil management group: Wurtsmith—5a; Meehan—5b; Deer Park—5.3a

438C—Meehan-Tawas-Wurtsmith complex, 0 to 12 percent slopes

Setting

Landform: Beach ridges on lake plains (fig. 11)
Slope range: Meehan—0 to 3 percent; Tawas—0 to 2 percent; Wurtsmith—0 to 12 percent
Shape of areas: Linear
Size of areas: 500 to 1,000 acres

Typical Profile

Meehan

Surface layer:
0 to 2 inches—very dark gray sand

Subsurface layer:
2 to 9 inches—pale brown sand

Subsoil:
9 to 43 inches—brown, yellowish brown, and light yellowish brown, mottled, very friable sand

Substratum:
43 to 80 inches—brown sand

Tawas

Surface layer:
0 to 12 inches—black muck

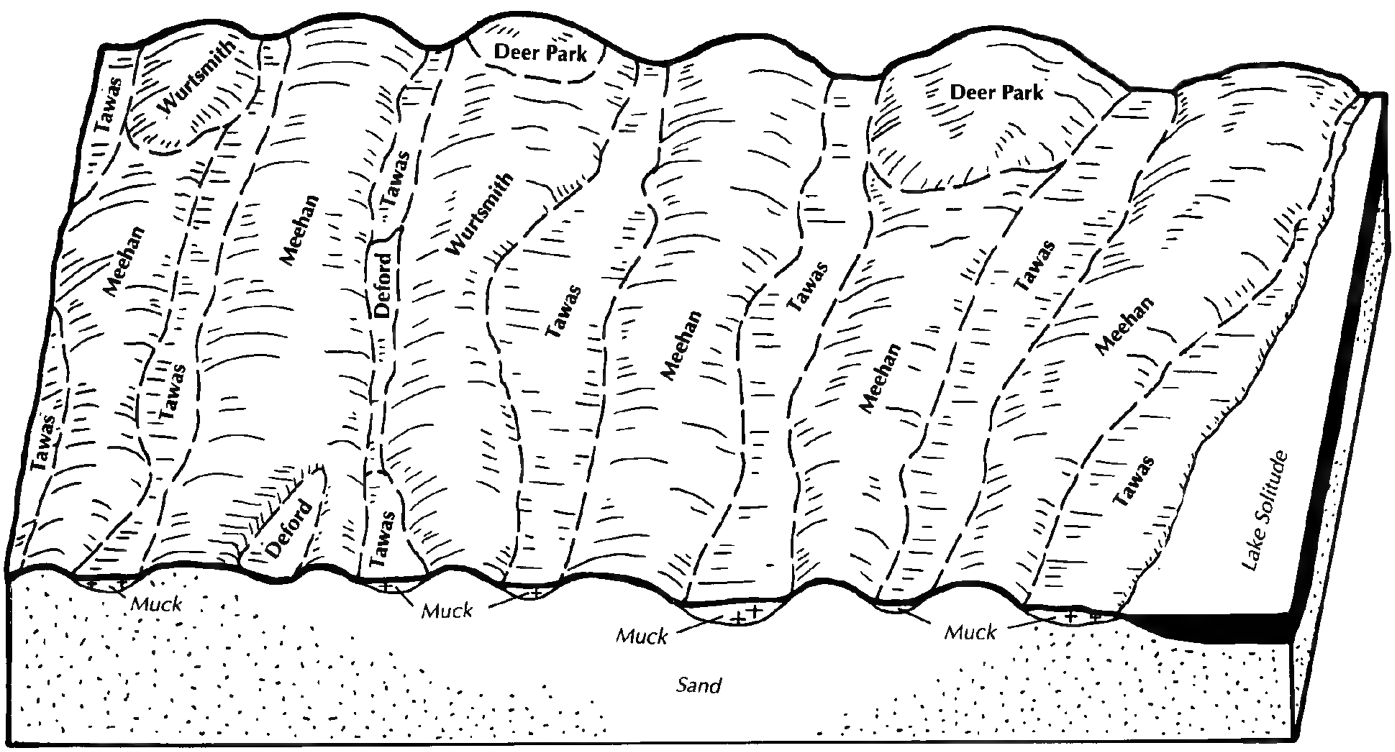

Figure 11.—Typical pattern of soils on the landscape in an area of Meehan-Tawas-Wurtsmith complex, 0 to 12 percent slopes.

Subsoil:
12 to 24 inches—black, very friable muck

Substratum:
24 to 80 inches—light brownish gray sand

Wurtsmith

Surface layer:
0 to 1 inch—black, partially decomposed leaf litter

Subsurface layer:
1 to 4 inches—grayish brown sand

Subsoil:
4 to 14 inches—yellowish brown, very friable sand
14 to 24 inches—brownish yellow, mottled, very friable sand

Substratum:
24 to 80 inches—pale brown and brown sand

Soil Properties and Qualities

Permeability: Meehan—rapid; Tawas—moderately slow to moderately rapid in the mucky part and rapid in the sandy part; Wurtsmith—rapid
Available water capacity: Meehan—low; Tawas—high; Wurtsmith—low
Drainage class: Meehan—somewhat poorly drained; Tawas—very poorly drained; Wurtsmith—moderately well drained
Seasonal high water table: Meehan—apparent, at a depth of 1 to 3 feet at some time from October through June; Tawas—apparent, 1 foot above to 1 foot below the surface at some time from October through May; Wurtsmith—apparent, at a depth of 2.0 to 3.5 feet at some time from November through May
Surface runoff: Meehan—very slow; Tawas—very slow or ponded; Wurtsmith—very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Meehan—severe; Tawas—moderate; Wurtsmith—severe
Shrink-swell potential: Low
Potential for frost action: Meehan—moderate; Tawas—high; Wurtsmith—low

Composition

Meehan soil and similar soils: 30 to 40 percent
Tawas soil and similar soils: 30 to 40 percent
Wurtsmith soil and similar soils: 25 to 30 percent
Contrasting inclusions: 15 to 25 percent

Inclusions

Contrasting inclusions:
- The very poorly drained Deford soils, which contain less than 8 inches of muck at the surface
- The excessively drained Deer Park soils

Similar inclusions:
- Soils that have a darker subsoil
- Soils that have 8 to 16 inches of muck at the surface

Use and Management

Dominant land use: Woodland

Woodland

Major management concerns: Meehan and Tawas—equipment limitations, seedling mortality, plant competition, seasonal wetness, windthrow hazard; Wurtsmith—equipment limitations, seedling mortality, seasonal droughtiness
Management considerations:
- Because loose sand in areas of the Meehan and Wurtsmith soils can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- Because of wetness and low strength, special harvesting equipment is needed in areas of the Tawas soil. The equipment can be used only during periods in winter when skid roads and access roads are frozen.
- Planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate in areas of the Wurtsmith soil. Replanting is needed in some areas.
- Planting when the soil is moist can reduce the seedling mortality rate in areas of the Wurtsmith soil.
- In areas of the Meehan soil, the seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
- Trees that can withstand seasonal wetness should be selected for planting on the Meehan soil.
- In areas of the Meehan and Tawas soils, windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
- Carefully managed reforestation helps to control undesirable understory plants in areas of the Meehan soil.
- Special harvest methods may be needed to control undesirable plants in areas of the Meehan soil.
- In areas of the Tawas soil, using selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings are beneficial for natural regeneration.
- Because of wetness, seedling mortality, and plant competition, trees are generally not planted on the Tawas soil.

Building sites

Major management concerns: Meehan and Wurtsmith—cutbanks caving, seasonal wetness, slope; Tawas—ponding
Management considerations:
- Because cutbanks in areas of the Meehan and Wurtsmith soils are not stable and are subject to caving, trench walls should be reinforced.
- In areas of the Meehan and Wurtsmith soils, buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
- Wetness in areas of the Meehan and Wurtsmith soils can be reduced by installing a drainage system around structures with basements and crawl spaces.
- Buildings in the sloping areas of the Wurtsmith soil should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.
- Because of ponding, the Tawas soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Meehan and Wurtsmith—rapid permeability, seasonal wetness; Tawas—ponding
Management considerations:
- The poor filtering capacity of the Meehan and Wurtsmith soils can result in the pollution of ground water.
- Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
- In areas of the Meehan and Wurtsmith soils, filling or mounding with suitable material helps to raise the absorption field above the water table.
- Because of ponding, the Tawas soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: IVw
Woodland ordination symbol: Meehan and Tawas—5W; Wurtsmith—6S
Michigan soil management group: Meehan—5b; Tawas—M/4c; Wurtsmith—5a

439D—Deer Park sand, 4 to 18 percent slopes

Setting

Landform: Beach ridges and dunes
Shape of areas: Linear
Size of areas: 25 to 2,000 acres

Typical Profile

Surface layer:
0 to 1 inch—black, well decomposed leaf litter

Subsurface layer:
1 to 6 inches—gray sand

Subsoil:
6 to 10 inches—dark yellowish brown, very friable sand
10 to 13 inches—yellowish brown and brownish yellow, very friable sand
13 to 18 inches—light yellowish brown and brownish yellow, very friable sand

Substratum:
18 to 80 inches—pale brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Excessively drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Low

Composition

Deer Park soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Au Gres soils
- The very poorly drained Deford soils
- The moderately well drained Wurtsmith soils

Similar inclusions:
- Soils that have a darker subsoil
- Soils that have fine sand in the substratum

Use and Management

Dominant land use: Woodland

Woodland

Major management concerns: Seasonal droughtiness, equipment limitations, seedling mortality, slope
Management considerations:
- Because loose sand can interfere with the traction of wheeled equipment, logging roads should be stabilized.
- Planting when the soil is moist can reduce the seedling mortality rate. Planting seedlings that can withstand droughty conditions can also reduce the seedling mortality rate. Replanting is needed in some areas.
- The grade should be kept as low as possible.

Building sites

Major management concerns: Cutbanks caving, slope
Management considerations:
- Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
- Because of the slope, this soil is poorly suited to building site development unless extensive land shaping is feasible.

Septic tank absorption fields

Major management concerns: Rapid permeability, slope
Management considerations:
- The poor filtering capacity of this soil can result in the pollution of ground water.
- Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
- Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: VIIs
Woodland ordination symbol: 4S
Michigan soil management group: 5.3a

440B—Kawkawlin-Sims complex, 0 to 4 percent slopes

Setting

Landform: Till plains and moraines (fig. 12)
Slope range: Kawkawlin—0 to 4 percent; Sims—0 to 2 percent
Shape of areas: Irregular
Size of areas: 50 to 1,000 acres

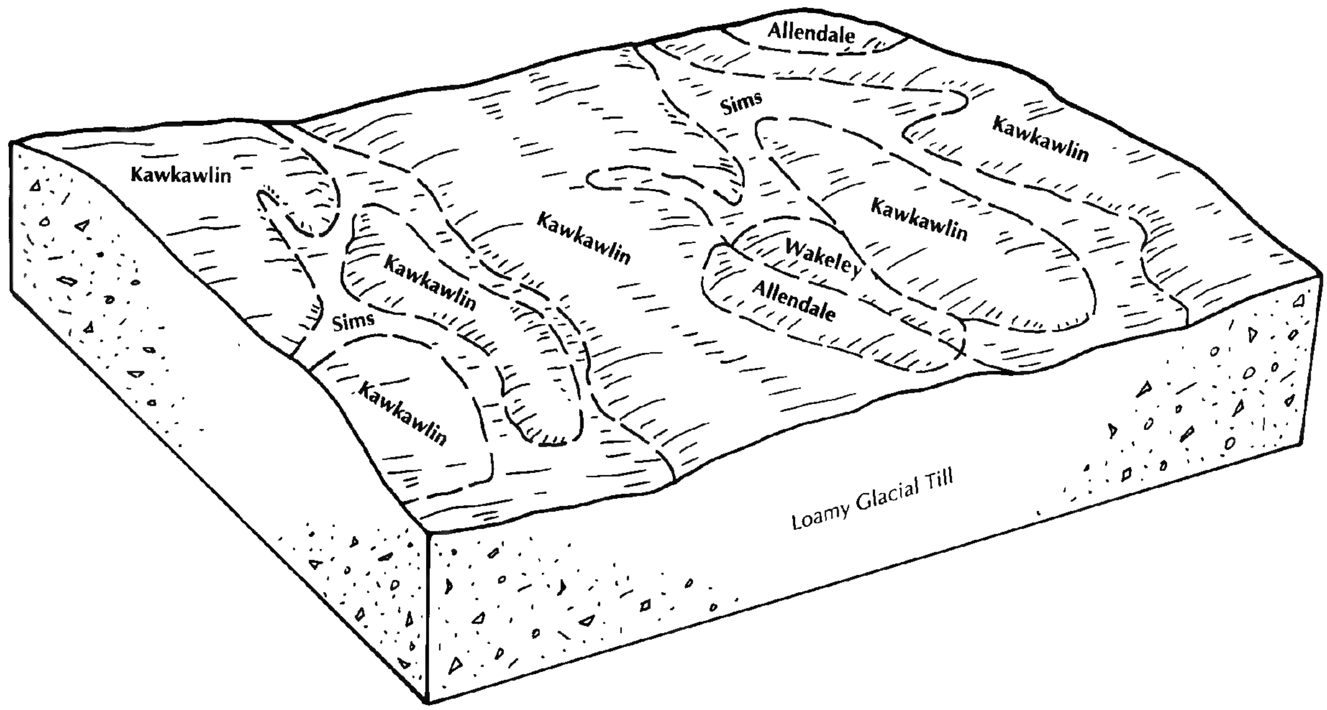

Figure 12.—Typical pattern of soils on the landscape in an area of Kawkawlin-Sims complex, 0 to 4 percent slopes.

Typical Profile

Kawkawlin

Surface layer:
0 to 6 inches—very dark grayish brown sandy loam

Subsurface layer:
6 to 8 inches—light brownish gray, mottled sandy loam

Subsoil:
8 to 13 inches—yellowish brown, mottled, friable sandy loam
13 to 18 inches—light brownish gray sandy loam and dark brown, mottled, friable clay loam
18 to 37 inches—light brown, mottled, friable clay loam

Substratum:
37 to 60 inches—brown sandy clay loam
60 to 80 inches—brown, mottled sandy clay loam

Sims

Surface layer:
0 to 5 inches—black loam

Subsoil:
5 to 13 inches—dark gray and gray, mottled, firm clay loam
13 to 47 inches—gray, mottled, firm clay loam

Substratum:
47 to 80 inches—light reddish brown, mottled clay loam

Soil Properties and Qualities

Permeability: Slow
Available water capacity: High
Drainage class: Kawkawlin—somewhat poorly drained; Sims—poorly drained
Seasonal high water table: Kawkawlin—perched at a depth of 0.5 foot to 1.5 feet at some time from October through May; Sims—perched 1 foot above to 1 foot below the surface at some time from October through May
Surface runoff: Kawkawlin—medium; Sims—very slow or ponded
Flooding: None
Hazard of water erosion: Kawkawlin—moderate; Sims—slight
Hazard of soil blowing: Kawkawlin—moderate; Sims—slight
Shrink-swell potential: Moderate
Potential for frost action: High

Composition

Kawkawlin soil and similar soils: 50 to 60 percent
Sims soil and similar soils: 25 to 30 percent
Contrasting inclusions: 10 to 20 percent

Inclusions

Contrasting inclusions:
• The very poorly drained Wakeley soils
• The somewhat poorly drained, sandy over clayey Allendale soils

Similar inclusions:
• Soils that have a surface layer of sandy loam

Use and Management

Dominant land use: Woodland
Other uses: Cropland, pasture

Cropland

Major management concerns: Kawkawlin—restricted permeability, seasonal wetness, tilth in the surface layer, water erosion, nutrient and pesticide loss; Sims—restricted permeability, seasonal wetness, tilth in the surface layer, ponding, compaction
Management considerations:
• Both surface and subsurface drainage systems are needed to reduce the wetness.
• Because of the restricted permeability, subsurface drains should be narrowly spaced.
• Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.
• Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to prevent excessive soil loss in areas of the Kawkawlin soil.
• In areas of the Kawkawlin soil, conservation tillage systems, contour farming, cover crops, and sod-based rotations can minimize the detachment and loss of nutrients associated with sediment and thus help to prevent the loss of solid-phase nitrogen and phosphorus.

Pasture

Major management concerns: Seasonal wetness, overgrazing, compaction
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Restricted grazing during wet periods helps to prevent compaction and poor tilth.
• Applying lime and fertilizer according to soil tests can help to ensure the maximum growth of plants.

Woodland

Major management concerns: Kawkawlin—equipment limitations, windthrow hazard, plant competition, seasonal wetness; Sims—equipment limitations, windthrow hazard, plant competition, seasonal wetness, seedling mortality
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Skidders should not be used during wet periods, when ruts form easily.
• Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Trees that can withstand seasonal wetness should be selected for planting on the Kawkawlin soil.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on these soils.

Building sites

Major management concerns: Kawkawlin—seasonal wetness, shrink-swell; Sims—ponding
Management considerations:
• In areas of the Kawkawlin soil, buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness in areas of the Kawkawlin soil can be reduced by installing a drainage system around structures with basements and crawl spaces.
• Because of ponding, the Sims soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Kawkawlin—seasonal wetness, restricted permeability; Sims—ponding
Management considerations:
• In areas of the Kawkawlin soil, filling or mounding with suitable material helps to raise the absorption field above the water table.
• Enlarging or pressurizing the absorption field or

installing alternating drainfields helps to overcome the restricted permeability of the Kawkawlin soil.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability of the Kawkawlin soil.
• Because of ponding, the Sims soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: Kawkawlin—3W; Sims—4W
Michigan soil management group: Kawkawlin—1.5b; Sims—1.5c

441B—Morganlake-Nester complex, 0 to 6 percent slopes

Setting

Landform: Till plains and moraines
Slope range: Morganlake—0 to 6 percent; Nester—1 to 6 percent
Shape of areas: Irregular
Size of areas: 50 to 300 acres

Typical Profile

Morganlake

Surface layer:
0 to 4 inches—black sand

Subsurface layer:
4 to 6 inches—light brownish gray sand

Subsoil:
6 to 13 inches—dark brown, friable sand
13 to 23 inches—brown, very friable sand
23 to 29 inches—light brownish gray, mottled, very friable loamy sand
29 to 47 inches—dark brown, mottled, firm clay loam and pinkish gray, very friable sandy loam

Substratum:
47 to 80 inches—reddish brown, mottled clay loam

Nester

Surface layer:
0 to 11 inches—very dark grayish brown sandy loam

Subsoil:
11 to 17 inches—light grayish brown, friable sandy loam and dark brown clay loam
17 to 34 inches—brown, firm clay loam

Substratum:
34 to 50 inches—strong brown, mottled clay loam
50 to 80 inches—brown clay loam

Soil Properties and Qualities

Permeability: Morganlake—rapid in the sandy part and moderately slow in the loamy part; Nester—slow
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Morganlake—perched at a depth of 2.0 to 3.5 feet at some time from October through May; Nester—perched at a depth of 2.5 to 3.5 feet at some time from November through May
Surface runoff: Morganlake—very slow; Nester—medium
Flooding: None
Hazard of water erosion: Morganlake—slight; Nester—moderate
Hazard of soil blowing: Morganlake—severe; Nester—moderate
Shrink-swell potential: Moderate
Potential for frost action: Morganlake—low; Nester—moderate

Composition

Morganlake soil and similar soils: 45 to 55 percent
Nester soil and similar soils: 35 to 45 percent
Contrasting inclusions: 5 to 20 percent

Inclusions

Contrasting inclusions:
• The poorly drained Sims soils
• The somewhat poorly drained Kokosing soils

Similar inclusions:
• Soils in which the depth to a loamy substratum is more than 40 inches

Use and Management

Dominant land use: Woodland
Other uses: Cropland, pasture

Cropland

Major management concerns: Morganlake—soil blowing, seasonal droughtiness; Nester—soil blowing, water erosion, soil compaction, tilth in the surface layer, restricted permeability, seasonal wetness
Management considerations:
• Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing. Maintaining a permanent plant cover also helps to control soil blowing.
• Minimizing tillage and tilling and harvesting at the

proper soil moisture content help to prevent excessive compaction and maintain tilth.
• Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.
• A system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture and in reducing the hazard of soil blowing.
• In areas of the Nester soil, a system of conservation tillage that leaves crop residue on the surface helps to control water erosion, helps to prevent crusting during periods of heavy rainfall, and increases the rate of water infiltration.
• In areas of the Nester soil, most adapted crops can be grown if an adequate drainage system is installed.
• Because of the restricted permeability of the Nester soil, subsurface drains should be narrowly spaced.

Pasture

Major management concerns: Morganlake—seasonal droughtiness; Nester—compaction
Management considerations:
• In areas of the Morganlake soil, proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
• In areas of the Nester soil, proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Restricted grazing during wet periods helps to prevent compaction and poor tilth in areas of the Nester soil.

Woodland

Major management concerns: Morganlake—equipment limitations, plant competition, seedling mortality, seasonal droughtiness; Nester—equipment limitations, plant competition
Management considerations:
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.
• Because loose sand in areas of the Morganlake soil can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• In areas of the Morganlake soil, planting seedlings that can withstand droughty conditions can reduce the seedling mortality rate. Planting when the soil is moist and planting special nursery stock or containerized seedlings can also reduce the seedling mortality rate. Replanting is needed in some areas.
• In areas of the Nester soil, skidders should not be used during wet periods, when ruts form easily.

Building sites

Major management concerns: Morganlake—shrink-swell, seasonal wetness, cutbanks caving; Nester—shrink-swell, seasonal wetness
Management considerations:
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.
• Because cutbanks in areas of the Morganlake soil are not stable and are subject to caving, trench walls should be reinforced.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Morganlake—restricted permeability, seasonal wetness, rapid permeability; Nester—restricted permeability, seasonal wetness
Management considerations:
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.
• The poor filtering capacity of the Morganlake soil can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: Morganlake—6S; Nester—3L
Michigan soil management group: Morganlake—4/2a; Nester—1.5a

441C—Morganlake-Nester complex, 6 to 12 percent slopes

Setting

Landform: Till plains and moraines
Shape of areas: Irregular
Size of areas: 25 to 50 acres

Typical Profile

Morganlake

Surface layer:
0 to 4 inches—black sand

Subsurface layer:
4 to 6 inches—light brownish gray sand

Subsoil:
6 to 13 inches—dark brown, friable sand
13 to 23 inches—brown, very friable sand
23 to 29 inches—light brownish gray loamy sand
29 to 47 inches—dark brown, mottled, firm clay loam and pinkish gray, very friable sandy loam

Substratum:
47 to 80 inches—reddish brown, mottled clay loam

Nester

Surface layer:
0 to 11 inches—very dark grayish brown sandy loam

Subsoil:
11 to 17 inches—light grayish brown, friable sandy loam and dark brown clay loam
17 to 34 inches—brown, firm clay loam

Substratum:
34 to 50 inches—strong brown, mottled clay loam
50 to 80 inches—brown clay loam

Soil Properties and Qualities

Permeability: Morganlake—rapid in the sandy part and moderately slow in the loamy part; Nester—slow
Available water capacity: Moderate
Drainage class: Moderately well drained
Seasonal high water table: Morganlake—perched at a depth of 2.0 to 3.5 feet at some time from October through May; Nester—perched at a depth of 2.5 to 3.5 feet at some time from November through May
Surface runoff: Morganlake—slow; Nester—medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Morganlake—severe; Nester—moderate
Shrink-swell potential: Moderate
Potential for frost action: Morganlake—low; Nester—moderate

Composition

Morganlake soil and similar soils: 45 to 55 percent
Nester soil and similar soils: 35 to 45 percent
Contrasting inclusions: 5 to 20 percent

Inclusions

Contrasting inclusions:
- The poorly drained Sims soils
- The somewhat poorly drained Kokosing soils

Similar inclusions:
- Soils in which the depth to a loamy substratum is more than 40 inches

Use and Management

Dominant land use: Woodland
Other uses: Cropland, pasture

Cropland

Major management concerns: Morganlake—soil blowing, water erosion, seasonal droughtiness; Nester—soil blowing, water erosion, soil compaction, tilth in the surface layer, restricted permeability, seasonal droughtiness
Management considerations:
- Conservation tillage, windbreaks, crop residue management, stripcropping, vegetative barriers, cover crops, and crop rotations that include small grain and hay help to control soil blowing. Maintaining a permanent plant cover also helps to control soil blowing.
- Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to prevent excessive soil loss.
- Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.
- Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.
- A system of conservation tillage that leaves crop residue on the surface is effective in conserving moisture and in reducing the hazard of soil blowing.
- In areas of the Nester soil, a system of conservation tillage that leaves crop residue on the surface helps to control water erosion, helps to prevent crusting during periods of heavy rainfall, and increases the rate of water infiltration.
- In areas of the Nester soil, most adapted crops can be grown if an adequate drainage system is installed.
- Because of the restricted permeability, subsurface drains in areas of the Nester soil should be narrowly spaced.

Pasture

Major management concerns: Morganlake—seasonal droughtiness; Nester—compaction

Management considerations:
• In areas of the Morganlake soil, proper stocking rates, controlled grazing, and restricted use during dry periods help to keep the pasture in good condition.
• In areas of the Nester soil, proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.

Woodland

Major management concerns: Morganlake—equipment limitations, plant competition, seedling mortality, seasonal droughtiness; Nester—equipment limitations, plant competition
Management considerations:
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.
• Because loose sand in areas of the Morganlake soil can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• In areas of the Morganlake soil, planting when the soil is moist can reduce the seedling mortality rate. Planting special nursery stock or containerized seedlings or planting seedlings that can withstand droughty conditions can also reduce the seedling mortality rate. Replanting is needed in some areas.
• In areas of the Nester soil, skidders should not be used during wet periods, when ruts form easily.

Building sites

Major management concerns: Morganlake—shrink-swell, slope, seasonal wetness, cutbanks caving; Nester—shrink-swell, slope, seasonal wetness
Management considerations:
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.
• Because cutbanks in areas of the Morganlake soil are not stable and are subject to caving, trench walls should be reinforced.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.
• Buildings should be designed so that they conform to the natural slope of the land. Land shaping is necessary in some areas.

Septic tank absorption fields

Major management concerns: Morganlake—restricted permeability, slope, seasonal wetness, rapid permeability; Nester—restricted permeability, slope, seasonal wetness
Management considerations:
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.
• The poor filtering capacity of the Morganlake soil can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Land shaping and installing the distribution lines on the contour help to overcome the slope.

Interpretive Groups

Land capability classification: IIIs
Woodland ordination symbol: Morganlake—6S; Nester—3L
Michigan soil management group: Morganlake—4/2a; Nester—1.5a

442D—Menominee-Curtisville complex, 12 to 18 percent slopes

Setting

Landform: Till plains and moraines
Shape of areas: Irregular
Size of areas: 25 to 150 acres

Typical Profile

Menominee

Surface layer:
0 to 4 inches—very dark grayish brown sand

Subsurface layer:
4 to 7 inches—grayish brown sand

Subsoil:
7 to 18 inches—dark brown, very friable sand
18 to 23 inches—dark yellowish brown, very friable sand
23 to 39 inches—brown, firm clay loam and light brownish gray sandy loam
39 to 59 inches—reddish brown, firm clay loam

Substratum:
59 to 80 inches—brown loam

Curtisville

Surface layer:
0 to 5 inches—very dark grayish brown sandy loam

Subsoil:
5 to 10 inches—light brownish gray, friable sandy loam and dark yellowish brown sandy loam
10 to 16 inches—brown, firm clay loam and brown sandy loam
16 to 29 inches—dark brown, firm clay

Substratum:
29 to 47 inches—reddish brown clay loam
47 to 80 inches—brown clay loam

Soil Properties and Qualities

Permeability: Menominee—rapid in the sandy part and moderately slow in the loamy part; Curtisville—slow
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Menominee—medium; Curtisville—rapid
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Menominee—severe; Curtisville—moderate
Shrink-swell potential: Moderate
Potential for frost action: Menominee—low; Curtisville—moderate

Composition

Menominee soil and similar soils: 45 to 55 percent
Curtisville soil and similar soils: 35 to 45 percent
Contrasting inclusions: 5 to 20 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Kawkawlin and Kokosing soils

Similar inclusions:
• Soils in which the depth to loam till is more than 40 inches
• Soils that have a surface layer of clay loam

Use and Management

Dominant land use: Woodland

Woodland

Major management concerns: Menominee—equipment limitations, plant competition, seedling mortality, seasonal droughtiness; Curtisville—equipment limitations, plant competition, slope
Management considerations:
• The grade should be kept as low as possible in areas of the Curtisville soil.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Because loose sand in areas of the Menominee soil can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting when the Menominee soil is moist can reduce the seedling mortality rate.

Building sites

Major management concerns: Menominee—slope, cutbanks caving; Curtisville—slope, shrink-swell
Management considerations:
• Because of the slope, these soils are poorly suited to building site development unless extensive land shaping is feasible.
• Because cutbanks in areas of the Menominee soil are not stable and are subject to caving, trench walls should be reinforced.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling of the Curtisville soil.

Septic tank absorption fields

Major management concerns: Menominee—slope, restricted permeability, rapid permeability; Curtisville—slope, restricted permeability
Management considerations:
• The poor filtering capacity of the Menominee soil can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
• Land shaping and installing the distribution lines on the contour help to overcome the slope.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: Menominee—6S; Curtisville—3L
Michigan soil management group: Menominee—4/2a; Curtisville—1.5a

442E—Menominee-Curtisville complex, 18 to 35 percent slopes

Setting

Landform: Till plains and moraines
Shape of areas: Irregular
Size of areas: 25 to 250 acres

Typical Profile

Menominee

Surface layer:
0 to 4 inches—very dark grayish brown sand

Subsurface layer:
4 to 7 inches—grayish brown sand

Subsoil:
7 to 18 inches—dark brown, very friable sand
18 to 23 inches—dark yellowish brown, very friable sand
23 to 39 inches—brown, firm clay loam and light brownish gray sandy loam
39 to 59 inches—reddish brown, firm clay loam

Substratum:
59 to 80 inches—brown loam

Curtisville

Surface layer:
0 to 5 inches—very dark grayish brown sandy loam

Subsoil:
5 to 10 inches—light brownish gray, friable sandy loam and dark yellowish brown sandy loam
10 to 16 inches—brown, firm clay loam and brown sandy loam
16 to 29 inches—dark brown, firm clay

Substratum:
29 to 80 inches—reddish brown and brown clay loam

Soil Properties and Qualities

Permeability: Menominee—rapid in the sandy part and moderately slow in the loamy part; Curtisville—slow
Available water capacity: Moderate
Drainage class: Well drained
Seasonal high water table: At a depth of more than 6 feet
Surface runoff: Menominee—rapid; Curtisville—very rapid
Flooding: None
Hazard of water erosion: Severe
Hazard of soil blowing: Menominee—severe; Curtisville—moderate
Shrink-swell potential: Moderate
Potential for frost action: Menominee—low; Curtisville—moderate

Composition

Menominee soil and similar soils: 45 to 55 percent
Curtisville soil and similar soils: 35 to 45 percent
Contrasting inclusions: 5 to 20 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Kawkawlin and Kokosing soils

Similar inclusions:
• Soils in which the depth to loam till is more than 40 inches
• Soils that have a surface layer of clay loam

Use and Management

Dominant land use: Woodland

Woodland

Major management concerns: Menominee—equipment limitations, erosion hazard, plant competition, slope, seedling mortality, seasonal droughtiness; Curtisville—equipment limitations, erosion hazard, plant competition, slope
Management considerations:
• Because of the slope, special care is needed in laying out logging roads and landings and in operating logging equipment. Logging roads should be designed so that they conform to the topography.
• Because of the erosion hazard, water should be removed from logging roads by water bars, out-sloping or in-sloping road surfaces, culverts, and drop structures. Building logging roads on the contour or on the gentler slopes and seeding logging roads, skid roads, and landings after the trees are logged also help to prevent excessive soil loss.
• The grade should be kept as low as possible.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.
• Small areas of nearly level included soils, if any are available, and suitable nearly level adjacent areas should be selected as sites for landings.
• Because loose sand in areas of the Menominee soil can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Planting when the Menominee soil is moist can reduce the seedling mortality rate.

Building sites

Major management concerns: Slope

Management considerations:
• Because of the slope, these soils are generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Slope
Management considerations:
• Because of the slope, these soils are generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: Menominee—6R; Curtisville—3R
Michigan soil management group: Menominee—4/2a; Curtisville—1.5a

443B—Kawkawlin-Allendale-Aquepts complex, 0 to 4 percent slopes

Setting

Landform: Till plains and moraines
Slope range: Kawkawlin—0 to 4 percent; Allendale—0 to 3 percent; Aquepts—0 to 2 percent
Shape of areas: Irregular
Size of areas: 25 to 200 acres

Typical Profile

Kawkawlin

Surface layer:
0 to 6 inches—very dark grayish brown sandy loam

Subsurface layer:
6 to 8 inches—light brownish gray, mottled sandy loam

Subsoil:
8 to 13 inches—yellowish brown, mottled, friable sandy loam
13 to 18 inches—light brownish gray sandy loam and dark brown, mottled, friable clay loam
18 to 37 inches—light brown, mottled, friable clay loam

Substratum:
37 to 60 inches—brown sandy clay loam
60 to 80 inches—brown, mottled sandy clay loam

Allendale

Surface layer:
0 to 6 inches—very dark brown loamy sand

Subsurface layer:
6 to 8 inches—light brownish gray, mottled sand

Subsoil:
8 to 11 inches—dark brown, mottled, friable sand
11 to 18 inches—strong brown, mottled, friable sand
18 to 32 inches—pale brown, mottled, loose sand
32 to 36 inches—reddish brown, mottled, very firm clay

Substratum
36 to 43 inches—brown, mottled clay
43 to 80 inches—weak red, mottled clay

Aquepts

Surface layer:
0 to 8 inches—black sandy loam

Subsoil:
8 to 30 inches—brownish gray, friable clay loam

Substratum:
30 to 80 inches—light brownish gray clay

Soil Properties and Qualities

Permeability: Kawkawlin—slow; Allendale—rapid in the sandy part and very slow in the clayey part; Aquepts—moderate
Available water capacity: Kawkawlin—high; Allendale and Aquepts—moderate
Drainage class: Kawkawlin and Allendale—somewhat poorly drained; Aquepts—very poorly drained
Seasonal high water table: Kawkawlin and Allendale—perched at a depth of 0.5 foot to 1.5 feet at some time from October through May; Aquepts—perched at the surface to 1 foot above the surface at some time from January through December
Surface runoff: Kawkawlin—medium; Allendale—very slow; Aquepts—ponded
Flooding: None
Hazard of water erosion: Kawkawlin—moderate; Allendale and Aquepts—slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Kawkawlin—moderate; Allendale—high; Aquepts—moderate
Potential for frost action: Kawkawlin—high; Allendale—moderate; Aquepts—high

Composition

Kawkawlin soil and similar soils: 30 to 40 percent
Allendale soil and similar soils: 30 to 40 percent
Aquepts and similar soils: 20 to 30 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The poorly drained Sims soils

• The very poorly drained, sandy over clayey Wakeley soils

Similar inclusions:
• Soils that have a surface layer of loam
• Soils in which the depth to a loamy substratum is more than 40 inches

Use and Management

Dominant land use: Woodland

Woodland

Major management concerns: Equipment limitations, seedling mortality, windthrow hazard, seasonal wetness
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Skidders should not be used during wet periods, when ruts form easily.
• Trees that can withstand seasonal wetness should be selected for planting on the Kawkawlin and Allendale soils.
• Special site preparation, such as bedding before planting, can reduce the seedling mortality rate in areas of the Kawkawlin and Allendale soils.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on the Aquepts.
• Carefully managed reforestation helps to control undesirable understory plants.

Building sites

Major management concerns: Kawkawlin—seasonal wetness, shrink-swell; Allendale—seasonal wetness, shrink-swell, cutbanks caving; Aquepts—ponding
Management considerations:
• Buildings in areas of the Kawkawlin and Allendale soils can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Because of ponding, the Aquepts are generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Kawkawlin—seasonal wetness, restricted permeability; Allendale—seasonal wetness, rapid permeability, restricted permeability; Aquepts—ponding
Management considerations:
• In areas of the Kawkawlin and Allendale soils, filling or mounding with suitable material helps to raise the absorption field above the water table.
• Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability in the Kawkawlin soil and in the lower part of the Allendale soil.
• The poor filtering capacity of the upper part of the Allendale soil can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
• Because of ponding, the Aquepts are generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: Kawkawlin—3W; Allendale—4W; Aquepts—none assigned
Michigan soil management group: Kawkawlin—1.5b; Allendale—4/1b; Aquepts—none assigned

444B—Kawkawlin sandy loam, 0 to 4 percent slopes

Setting

Landform: Till plains and moraines
Shape of areas: Irregular
Size of areas: 5 to 150 acres

Typical Profile

Surface layer:
0 to 6 inches—very dark grayish brown sandy loam

Subsurface layer:
6 to 8 inches—light brownish gray, mottled sandy loam

Subsoil:
8 to 13 inches—yellowish brown, mottled, friable sandy loam
13 to 18 inches—light brownish gray sandy loam and dark brown, mottled, friable clay loam
18 to 37 inches—light brown, mottled, friable clay loam

Substratum:
37 to 60 inches—brown sandy clay loam
60 to 80 inches—brown, mottled sandy clay loam

Soil Properties and Qualities

Permeability: Slow

Available water capacity: High
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched at a depth of 0.5 foot to 1.5 feet at some time from October through May
Surface runoff: Medium
Flooding: None
Hazard of water erosion: Moderate
Hazard of soil blowing: Moderate
Shrink-swell potential: Moderate
Potential for frost action: High

Composition

Kawkawlin soil and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Kokosing soils, which have more sand in the surface layer and the upper part of the subsoil than the Kawkawlin soil
- The poorly drained Sims soils

Similar inclusions:
- Soils that have less clay in the subsoil
- Soils that have a surface layer of clay loam

Use and Management

Dominant land use: Cropland
Other uses: Pasture, woodland

Cropland

Major management concerns: Water erosion, seasonal wetness, tilth in the surface layer, nutrient and pesticide loss
Management considerations:
- Crop rotations that include close-growing crops, conservation tillage, grassed waterways, cover crops, and crop residue management help to control runoff and water erosion.
- Subsurface drains can reduce the wetness if a suitable outlet is available.
- Shallow surface ditches help to remove surface water after heavy rains.
- Returning crop residue to the soil, adding other organic material, and including grasses and legumes in the cropping sequence improve soil structure, water infiltration, and permeability.
- Minimizing tillage and tilling and harvesting at the proper soil moisture content help to prevent excessive compaction and maintain tilth.
- Conservation tillage systems, contour farming, cover crops, and sod-based rotations can minimize the detachment and loss of nutrients associated with sediment and thus help to prevent the loss of solid-phase nitrogen and phosphorus.

Pasture

Major management concerns: Seasonal wetness, overgrazing, compaction
Management considerations:
- Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
- Restricted grazing during wet periods helps to prevent compaction and poor tilth.
- Applying lime and fertilizer according to the results of soil tests helps to ensure the maximum growth of plants.

Woodland

Major management concerns: Equipment limitations, windthrow hazard, plant competition, seasonal wetness
Management considerations:
- The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
- Skidders should not be used during wet periods, when ruts form easily.
- Year-round logging roads require roadfill and gravel. Culverts are needed to maintain the natural drainage system.
- Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
- Trees that can withstand seasonal wetness should be selected for planting.
- Carefully managed reforestation helps to control undesirable understory plants.
- Special harvest methods may be needed to control undesirable plants.

Building sites

Major management concerns: Seasonal wetness, shrink-swell
Management considerations:
- Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
- Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.
- Properly designing and strengthening footings and

foundations can help to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Major management concerns: Seasonal wetness, restricted permeability
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Enlarging or pressurizing the absorption field or installing alternating drainfields helps to overcome the restricted permeability.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 3W
Michigan soil management group: 1.5b

445A—Corsair very fine sandy loam, 0 to 3 percent slopes

Setting

Landform: Lake plains
Shape of areas: Irregular
Size of areas: 5 to 25 acres

Typical Profile

Surface layer:
0 to 8 inches—very dark gray very fine sandy loam

Subsurface layer:
8 to 10 inches—pale brown fine sand and yellowish brown loamy fine sand

Subsoil:
10 to 15 inches—dark yellowish brown, friable fine sandy loam

Substratum:
15 to 80 inches—yellowish brown, mottled, stratified very fine sand, sand, and silt

Soil Properties and Qualities

Permeability: Moderate
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched at a depth of 1 to 2 feet at some time from October through May
Surface runoff: Slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Moderate
Shrink-swell potential: Low
Potential for frost action: Moderate

Composition

Corsair soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Ingalls soils, which contain more sand in the surface layer and subsoil than the Corsair soil
• The very poorly drained Deford soils

Similar inclusions:
• Soils that have less stratification in the substratum
• Soils that have more clay in the subsoil

Use and Management

Dominant land use: Cropland
Other uses: Pasture, woodland

Cropland

Major management concerns: Seasonal wetness, soil blowing, nutrient and pesticide loss
Management considerations:
• Conservation tillage, crop residue management, windbreaks, and cover crops help to control soil blowing.
• Timing fertilizer applications to meet crop nutrient needs, using split fertilizer applications, and applying fertilizer in bands may reduce the risk of nutrient leaching.
• Most adapted crops can be grown if an adequate drainage system is installed.
• Subsurface drains can reduce the wetness if a suitable outlet is available.

Pasture

Major management concerns: Seasonal wetness
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Hay and pasture plants that can withstand periodic inundation and seasonal wetness should be seeded.

Woodland

Major management concerns: Equipment limitations, windthrow hazard, plant competition, seasonal wetness
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.

• Trees that can withstand seasonal wetness should be selected for planting.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Building sites

Major management concerns: Seasonal wetness, cutbanks caving
Management considerations:
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.

Septic tank absorption fields

Major management concerns: Seasonal wetness
Management considerations:
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• A subsurface drainage system helps to lower the water table.

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 2W
Michigan soil management group: 3b-s

446B—Wurtsmith-Meehan-Urban land complex, 0 to 6 percent slopes

Setting

Landform: Beach ridges on lake plains
Slope range: Wurtsmith—0 to 6 percent; Meehan and Urban land—0 to 3 percent
Shape of areas: Irregular
Size of areas: 50 to 300 acres

Typical Profile

Wurtsmith

Surface layer:
0 to 1 inch—black, partially decomposed leaf litter

Subsurface layer:
1 to 4 inches—grayish brown sand

Subsoil:
4 to 14 inches—yellowish brown, very friable sand
14 to 24 inches—brownish yellow, mottled, very friable sand

Substratum:
24 to 80 inches—pale brown and brown sand

Meehan

Surface layer:
0 to 2 inches—very dark gray sand

Subsurface layer:
2 to 9 inches—pale brown sand

Subsoil:
9 to 43 inches—brown, yellowish brown, and light yellowish brown, mottled, very friable sand

Substratum:
43 to 80 inches—brown sand

Soil Properties and Qualities

Permeability: Rapid
Available water capacity: Low
Drainage class: Wurtsmith—moderately well drained; Meehan—somewhat poorly drained
Seasonal high water table: Wurtsmith—apparent, at a depth of 2.0 to 3.5 feet at some time from November through May; Meehan—apparent, at a depth of 1 to 3 feet at some time from October through June
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Low
Potential for frost action: Wurtsmith—low; Meehan—moderate

Composition

Wurtsmith soil and similar soils: 40 to 50 percent
Meehan soil and similar soils: 30 to 40 percent
Urban land: 20 to 30 percent
Contrasting inclusions: 5 to 15 percent

Inclusions

Contrasting inclusions:
• The very poorly drained Deford soils
• The excessively drained Grayling soils

Similar inclusions:
• Soils that have a darker subsoil

Use and Management

Dominant land use: Wurtsmith and Meehan—gardens, lawns, building sites, idle land; Urban land—streets, parking lots, sites for buildings and other structures

Gardens, lawns, and environmental plantings

Major management concerns: Low available water capacity, soil blowing
Management considerations
• Irrigation may be needed to maintain lawns and gardens.
• Perennial plants that can withstand droughtiness should be selected for planting.
• Maintaining a good plant cover and mulching can help to control soil blowing.

Building sites

Major management concerns: Wurtsmith and Meehan—cutbanks caving, seasonal wetness
Management considerations:
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.

Septic tank absorption fields

Major management concerns: Wurtsmith and Meehan—rapid permeability, seasonal wetness
Management considerations:
• The poor filtering capacity of the Wurtsmith and Meehan soils can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
• Sanitary facilities should be connected to public sewers and sewage treatment facilities.
• A subsurface drainage system helps to lower the water table.

Interpretive Groups

Land capability classification: Wurtsmith and Meehan—IVs
Woodland ordination symbol: Wurtsmith—6S; Meehan—5W
Michigan soil management group: Wurtsmith—5a; Meehan—5b

447A—Whittemore sand, 0 to 3 percent slopes

Setting

Landform: Lake plains
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Surface layer:
0 to 9 inches—very dark gray sand

Subsurface layer:
9 to 12 inches—light grayish brown and light gray sand

Subsoil:
12 to 17 inches—dark reddish brown, mottled, strongly cemented, firm sand
17 to 35 inches—yellowish brown and light yellowish brown, mottled, loose sand
35 to 44 inches—light reddish brown, mottled, firm silty clay

Substratum:
44 to 80 inches—reddish brown, mottled silty clay

Soil Properties and Qualities

Permeability: Moderately rapid in the sandy part and very slow in the clayey part
Available water capacity: Low
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched at a depth of 0.5 foot to 1.5 feet at some time from October through May
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: High
Potential for frost action: Moderate

Composition

Whittemore soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, clayey Algonquin soils
• The very poorly drained Wakeley soils

Similar inclusions:
• Soils that have less cementation in the subsoil
• Soils that have less clay in the substratum

Use and Management

Dominant land use: Woodland
Other uses: Pasture

Pasture

Major management concerns: Seasonal wetness
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Hay and pasture plants that can withstand periodic inundation and seasonal wetness should be seeded.

Woodland

Major management concerns: Seasonal wetness, equipment limitations, plant competition, seedling mortality, windthrow hazard
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Trees that can withstand seasonal wetness should be selected for planting.
• Carefully managed reforestation helps to control undesirable understory plants.
• Special harvest methods may be needed to control undesirable plants.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Building sites

Major management concerns: Seasonal wetness, cutbanks caving, shrink-swell
Management considerations:
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.
• Properly designing and strengthening footings and foundations can help to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Major management concerns: Seasonal wetness, rapid permeability, restricted permeability
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 4W
Michigan soil management group: 5/2b

448A—Meehan-Tawas complex, 0 to 3 percent slopes

Setting

Landform: Beach ridges on lake plains
Slope range: Meehan—0 to 3 percent; Tawas—0 to 2 percent
Shape of areas: Linear
Size of areas: 50 to 300 acres

Typical Profile

Meehan

Surface layer:
0 to 2 inches—very dark gray sand

Subsurface layer:
2 to 9 inches—pale brown sand

Subsoil:
9 to 12 inches—brown, mottled, very friable sand
12 to 21 inches—yellowish brown, mottled, very friable sand
21 to 43 inches—light yellowish brown, mottled, loose sand

Substratum:
43 to 80 inches—brown sand

Tawas

Surface layer:
0 to 12 inches—black muck

Subsoil:
12 to 24 inches—black, very friable muck

Substratum:
24 to 80 inches—light brownish gray sand

Soil Properties and Qualities

Permeability: Meehan—rapid; Tawas—moderately slow to moderately rapid in the mucky part and rapid in the sandy part
Available water capacity: Meehan—low; Tawas—high
Drainage class: Meehan—somewhat poorly drained; Tawas—very poorly drained
Seasonal high water table: Meehan—apparent, at a depth of 1 to 3 feet at some time from October through June; Tawas—apparent, 1 foot above to 1 foot below the surface at some time from October through May
Surface runoff: Meehan—very slow; Tawas—very slow or ponded
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Meehan—severe; Tawas—moderate
Shrink-swell potential: Low
Potential for frost action: Meehan—moderate; Tawas—high

Composition

Meehan soil and similar soils: 50 to 60 percent
Tawas soils and similar soils: 30 to 40 percent
Contrasting inclusions: 15 to 25 percent

Inclusions

Contrasting inclusions:
• The very poorly drained Deford soils, which have less than 8 inches of muck at the surface
• The excessively drained Grayling soils

Similar inclusions:
• Soils that have a darker subsoil

Use and Management

Dominant land use: Woodland

Woodland

Major management concerns: Equipment limitations, seedling mortality, plant competition, seasonal wetness, windthrow hazard
Management considerations:
• Because loose sand in areas of the Meehan soil can interfere with the traction of wheeled equipment, logging roads should be stabilized.
• Because of wetness and low strength, special harvesting equipment is needed in areas of the Tawas soil. The equipment can be used only during periods in winter when skid roads and access roads are frozen.
• In areas of the Meehan soil, the seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Trees that can withstand seasonal wetness should be selected for planting on the Meehan soil.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.
• Carefully managed reforestation helps to control undesirable understory plants in areas of the Meehan soil.
• Special harvest methods may be needed to control undesirable plants in areas of the Meehan soil.
• In areas of the Tawas soil, selective cutting or cutting in strips and leaving desirable seed trees along the edge of the openings are beneficial for natural regeneration.
• Because of wetness, seedling mortality, and plant competition, trees are generally not planted on the Tawas soil.

Building sites

Major management concerns: Meehan—cutbanks caving, seasonal wetness; Tawas—ponding
Management considerations:
• Because cutbanks in areas of the Meehan soil are not stable and are subject to caving, trench walls should be reinforced.
• In areas of the Meehan soil, buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness in areas of the Meehan soil can be reduced by installing a drainage system around structures with basements and crawl spaces.
• Because of ponding, the Tawas soil is generally unsuited to building site development.

Septic tank absorption fields

Major management concerns: Meehan—rapid permeability, seasonal wetness; Tawas—ponding
Management considerations:
• The poor filtering capacity of the Meehan soil can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
• In areas of the Meehan soil, filling or mounding with suitable material helps to raise the absorption field above the water table.
• Because of ponding, the Tawas soil is generally unsuited to septic tank absorption fields.

Interpretive Groups

Land capability classification: IVw
Woodland ordination symbol: Meehan—5W; Tawas—5W
Michigan soil management group: Meehan—5b; Tawas—M/4c

449A—Kokosing sand, 0 to 3 percent slopes

Setting

Landform: Till plains and moraines
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Surface layer:
0 to 9 inches—very dark grayish brown sand

Subsoil:
9 to 27 inches—dark yellowish brown and yellowish brown, mottled, very friable sand
27 to 32 inches—pale brown, friable loamy sand and brown, mottled, friable loam
32 to 38 inches—reddish brown, friable loam and light brownish gray, mottled, friable sandy loam
38 to 53 inches—reddish brown, mottled, friable loam

Substratum:
53 to 80 inches—reddish brown loam

Soil Properties and Qualities

Permeability: Rapid in the sandy part and moderately slow in the loamy part
Available water capacity: Moderate
Drainage class: Somewhat poorly drained
Seasonal high water table: Perched at a depth of 0.5 foot to 2.5 feet at some time from October through May
Surface runoff: Very slow
Flooding: None
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Shrink-swell potential: Moderate
Potential for frost action: Moderate

Composition

Kokosing soil and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Kawkawlin soils, which contain less clay in the surface layer and the upper part of the subsoil than the Kokosing soil
• The very poorly drained Wakeley soils

Similar inclusions:
• Soils that have less clay in the substratum

Use and Management

Dominant land use: Woodland
Other uses: Cropland, pasture

Cropland

Major management concerns: Seasonal wetness, soil blowing, nutrient and pesticide loss
Management considerations:
• Conservation tillage, crop residue management, windbreaks, and cover crops help to control soil blowing.
• Timing fertilizer applications to meet crop nutrient needs, using split fertilizer applications, and applying fertilizer in bands may reduce the risk of nutrient leaching.
• The nutrients in manure and fertilizer applications should not exceed the requirements of the plants.
• Most adapted crops can be grown if an adequate drainage system is installed.
• Subsurface drains can reduce the wetness if a suitable outlet is available.

Pasture

Major management concerns: Seasonal wetness
Management considerations:
• Proper stocking rates, a planned grazing system, and deferred grazing during wet periods help to keep the pasture in good condition.
• Hay and pasture plants that can withstand periodic inundation and seasonal wetness should be seeded.

Woodland

Major management concerns: Seasonal wetness, equipment limitations, plant competition, seedling mortality, windthrow hazard
Management considerations:
• The seasonal high water table restricts the use of equipment to midsummer, when the soil is dry, or midwinter, when the soil is frozen or has an adequate snow cover.
• Trees that can withstand seasonal wetness should be selected for planting.
• Carefully managed reforestation helps to control undesirable understory plants.

• Special harvest methods may be needed to control undesirable plants.
• Windthrow can be minimized by harvest methods that do not leave the remaining trees widely spaced and by such harvest methods as selective cutting and strip cutting.

Building sites

Major management concerns: Seasonal wetness, cutbanks caving
Management considerations:
• Buildings can be constructed on well compacted fill material, which raises the site a sufficient distance above the water table.
• Wetness can be reduced by installing a drainage system around structures with basements and crawl spaces.
• Because cutbanks are not stable and are subject to caving, trench walls should be reinforced.

Septic tank absorption fields

Major management concerns: Seasonal wetness, rapid permeability, restricted permeability
Management considerations:
• The poor filtering capacity of this soil can result in the pollution of ground water.
• Large lots, an absorption system of shallow trenches with shrubbery planted around the perimeter of the system, and low, uniform application rates help to prevent the pollution of ground water.
• Filling or mounding with suitable material helps to raise the absorption field above the water table.
• Backfilling the trenches with porous material helps to compensate for the restricted permeability.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 2W
Michigan soil management group: 4/2b

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Some map units in the Huron National Forest were designed differently from the map units in other parts of the survey area. Information for these map units may not be included in some of the tables associated with this section of the survey.

Crops and Pasture

General management needed for crops and pasture is suggested in this section. The estimated yields of the main crops and pasture plants are listed for each soil, the system of land capability classification used by the Natural Resources Conservation Service is explained, and prime farmland is described.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading "Detailed Soil Map Units." Specific information can be obtained from the local office of the Natural Resources Conservation Service or the Extension Service.

In 1987, Iosco County had approximately 26,800 acres of cropland. Of this acreage, about 8,000 acres was planted to corn, 1,400 acres to wheat, 1,200 acres to oats, 350 acres to soybeans, and 150 acres to barley. The county also had more than 10,000 acres of pasture (Fedewa, 1993).

The following paragraphs describe the concerns affecting management of the soils in the county for agriculture. These concerns include water erosion, soil blowing, seasonal wetness, seasonal droughtiness, and the improvement of soil fertility and tilth of the surface layer.

Water erosion and soil blowing are major management concerns on most of the cropland in the county. The loss of the surface layer through erosion is especially damaging on soils that have a clayey subsoil, such as Kent, Nester, Curtisville, Mongo, and Negwegon soils, and on soils that tend to be droughty, such as Rubicon and Grayling soils. Erosion on cropland results in the sedimentation of streams and ditches. Controlling erosion minimizes this pollution and improves the quality of water for municipal and recreational uses and for fish and wildlife.

Water erosion is a serious hazard on all loamy soils that have slopes of 4 percent or more. Preparing a good seedbed is difficult on some of the soils because the friable surface layer has been eroded away in places.

Erosion-control practices provide a protective cover, reduce the runoff rate, and increase the rate of water infiltration. A cropping system that keeps a plant cover on the surface for extended periods reduces the susceptibility to erosion and preserves the productive capacity of the soil. On livestock farms, where pasture and hay are needed, including forage crops of grasses and legumes in the cropping sequence helps to control erosion in the more sloping areas, provides nitrogen for subsequent crops, and improves tilth. Conservation tillage helps to control runoff and erosion by leaving a protective cover of crop residue on the surface. Cover crops, diversions, and grassed waterways also help to control erosion.

Soil blowing is a hazard on the sandy soils in the county. An adequate plant cover, surface mulch, buffer strips, and tillage methods that leave crop residue on the surface help to control soil blowing.

No-till farming, which is increasingly common in the county, is effective in controlling water erosion and soil blowing because it leaves crop residue on the surface. This method is suited to most of the soils in the county. When no-till farming methods are applied, eroding areas that otherwise are only marginally productive can become more productive. No-till helps to maintain the productive capacity of nearly all cropland. In areas where no-till crops are grown, different methods of planting and of controlling insects and weeds are needed. Planting at the proper time, selecting herbicides that are suited to the existing vegetation, providing an adequate supply of plant nutrients, and selecting tillage systems based on soil characteristics are important management requirements.

Much of the permanent pasture in the county is in areas where erosion is a hazard. Control of erosion is particularly important when the pasture is seeded. Forage production and the extent to which the plant cover protects the surface of the soil are influenced by the number of livestock that the pasture supports, the length of time that they graze, and the distribution of rainfall. Good pasture management includes stocking rates that maintain the key forage species, weed control, lime and fertilizer, pasture rotation, deferred grazing, timely grazing, and the strategic placement of water supplies for livestock.

Information about the design and application of erosion-control practices for different soils is available in local offices of the Conservation Districts.

Seasonal wetness is a major management concern in many areas used for crops and pasture. Drainage of cropland improves the air-water relationship in the root zone. In areas where drainage is poor, spring planting, spraying, and harvesting are delayed and controlling weeds is difficult. Properly designed subsurface drainage systems or surface drainage systems, or both, can be used to remove excess water.

Unless they are drained, some soils are naturally so wet that they cannot be used for the crops commonly grown in the county. In undrained areas, very poorly drained, poorly drained, and somewhat poorly drained soils are so wet that crops are damaged in most years. Springport, Sims, Selkirk, and Algonquin soils are examples of poorly drained and somewhat poorly drained soils. Natural drainage is good most of the year in the moderately well drained Kent, Nester, and Negwegon soils, but water tends to perch in these soils, and they dry slowly after rains. Small areas of the wetter soils along drainageways and in swales are commonly mapped as inclusions in some areas of these soils, especially where slopes are 2 to 6 percent. Artificial drainage is needed to maximize crop production in these areas.

The design of surface and subsurface drainage systems varies with the kind of soil. A combination of surface drainage and subsurface drainage is needed in most areas of poorly drained soils that are intensively row cropped. The drains should be more closely spaced in soils that are slowly and very slowly permeable than in the more permeable soils. Finding adequate outlets for subsurface drainage systems is difficult in many areas of Sims and Springport soils. Diversions can be used to remove surface runoff from some wet areas. Good soil tilth and an ample supply of organic matter also improve drainage. In low-lying areas the growing season is shortened by frost in the late spring and early fall.

If drainage is planned, care must be taken so that designated wetlands are not affected. Drainage of these areas could violate existing laws and regulations and may jeopardize receipt of USDA benefits. Information about the design of drainage systems for each kind of soil is available in local offices of the Natural Resources Conservation Service.

Seasonal droughtiness during dry periods is a concern affecting the management of Allendale, Morganlake, Skeel, and Kokosing soils. Moisture can be conserved by no-till farming and other kinds of conservation tillage, which leave all or part of the crop residue on the surface. Increasing the content of organic matter improves the available water capacity. Irrigation improves productivity. The droughty soils and many other soils in the county are suited to irrigation if they are properly managed.

Soil tilth is an important factor affecting the germination of seeds and the infiltration of water into the soil. Some of the soils used for crops have a loamy surface layer. Generally, the structure of such soils is weak, and intense rainfall causes the surface to crust.

This crusting hinders the emergence of plant seedlings, reduces the rate of water infiltration, and increases the runoff rate. Regular additions of crop residue, manure, and other organic materials can improve tilth and can help to prevent surface crusting. Maintaining good tilth is difficult in the clayey soils, such as Kent, Nester, and Negwegon soils, because these soils stay wet until late spring. If the soils are plowed when wet, they tend to be very cloddy when dry and can become compacted. As a result, preparing a good seedbed is difficult. Cover crops, green manure crops, proper management of crop residue, conservation tillage, and applications of livestock manure help to maintain or improve tilth and the content of organic matter. Fall plowing and chisel plowing while the soils are at the proper moisture content can help to prevent deterioration of tilth in areas of nearly level, poorly drained or somewhat poorly drained soils. These practices also allow the soils to be tilled earlier the following spring. Fall plowing is not suitable, however, on sloping soils or on soils that are subject to soil blowing. Good management is needed in intensively cropped areas and in areas that are cultivated year after year.

Allowing grazing by livestock during periods when loamy or clayey soils are wet results in soil compaction and poor tilth. The compaction caused by grazing during wet periods retards the growth of pasture plants. Proper harvesting methods, such as those for hay or silage, increase plant growth and help to prevent compaction.

Soil fertility is naturally medium or high in the loamy soils and low in most of the sandy soils on uplands. Many sandy soils naturally range from strongly acid to slightly acid. If lime has never been applied on these soils, applications of ground limestone are needed to raise the pH level sufficiently for good growth of alfalfa and other crops that grow well only in areas where the soils are nearly neutral. Available phosphorus and potash levels are naturally low or medium in most of these soils. On all soils, additions of lime and fertilizer should be based on the results of soil tests, on the needs of the crop, and on the expected level of yields (Michigan State University, 1985).

The most common row crops that are suited to the soils and climate in Iosco County include corn, wheat, rye, barley, and oats. Alfalfa, alone or in mixtures of clover and grasses, is the most common hay crop.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of the map units in the survey area also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations also are considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit (USDA, 1961). Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

The capability classification of the map units in the survey area is given in the section "Detailed Soil Map Units" and in the yields table.

At the end of each map unit description under the heading "Detailed Soil Map Units," the Michigan soil management group is listed. The soils in each map unit are assigned to a group according to the dominant texture, the drainage class, and the main management concerns (Mokma, 1978).

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forest land, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

About 47,715 acres in the survey area, or 13 percent of the total acreage, meets the soil requirements for prime farmland. The map units in the survey area that are considered prime farmland are listed in table 6. This list does not constitute a recommendation for a particular land use. On some soils included in the list, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Woodland Management and Productivity

The major concerns associated with use and management of woodland are discussed in this section. Information is provided about the major kinds of cover and the relationship with the different kinds of soils. Present and potential woodland products are discussed. The plant communities and plant associations in the county also are described, and the Ecological Classification System is explained.

Iosco County originally was covered with virgin forests of pine and hardwoods. Much of the area was logged off in the late 1800's and early 1900's. Much of the current woodland supports second-growth timber, and many areas were replanted to pine. In the 1930's, the Civilian Conservation Corps did replanting in several areas in the county. The present woodland stands are smaller than the original stands but are still an important and valuable resource.

About 230,000 acres, or about 64 percent of Iosco County, is woodland. About 112,000 acres is part of the Huron National Forest (fig. 13), and about 25,000 acres is part of the Au Sable State Forest. The rest of the woodland, about 93,000 acres, is privately owned.

Forest Cover Types

Iosco County has four major types of forest cover. Each forest cover type has value and potential for forest use and for the production of woodland products that differ from those of the other types. In general, different soils support each of the different types of forest cover.

Jack pine forest cover type.—Jack pine and northern pine oak are the dominant species in areas of this cover type. Other associated trees are eastern white pine, red pine, and bigtooth aspen. This cover type is mainly in areas of the nearly level to steep Graycalm and Grayling soils. These soils are deep and sandy and have weak profile development. The more droughty and less fertile soils support only northern pine oak and jack pine. Tree growth is slow, and reestablishing trees in cutover areas is difficult.

Oak-red maple forest cover type.—Northern red oak and red maple are the dominant species in areas of this cover type. Other associated trees include bigtooth aspen, red pine, eastern white pine, and paper birch. The original virgin forest cover was mainly eastern white pine, which was almost completely removed by logging. Today, white pine makes up only a small part of the forest cover. Red maple distinguishes this cover type from transitional areas of the jack pine cover type. The oak-red maple cover type is mainly in areas of the Rubicon, Morganlake, Menominee, and Graycalm soils. The Rubicon soils are deep and sandy. The Graycalm soils have loamy or sandy bands in the subsoil. The Morganlake and Menominee soils have loamy materials at a depth of 20 to 40 inches. The Morganlake soils are moderately well drained. Tree growth is good on all of these soils. Young plantations of red pine and eastern white pine are common in areas of this cover type.

Red maple-paper birch-white spruce-balsam fir forest cover type.—Most stands of this cover type are a mixture of wetland hardwoods and conifers. Red maple, paper birch, quaking aspen, white spruce, balsam fir, and eastern hemlock are dominant. Other associated trees are eastern white pine, northern whitecedar, black ash, and balsam poplar. Also included are varying numbers of sugar maple and northern red oak. American elm was an important component of this cover type, but most of these trees have been killed by Dutch elm disease. In many areas much of the deadwood has been removed for use as firewood. This cover type is in areas of sandy and loamy soils that have a seasonal high water table. Examples are Au Gres, Croswell, Kokosing, Allendale, Ingalls, and Kawkawlin soils. Tree growth is fair or good on these soils.

Northern whitecedar forest cover type.—Northern whitecedar is dominant in areas of this cover type, but the common associated trees include black spruce, black ash, red maple, eastern hemlock, balsam fir, balsam poplar, and tamarack. This cover type is in areas of Lupton, Deford, Wakeley, and Tawas soils. These are poorly drained and very poorly drained, organic soils and sandy soils. The water table is at or near the surface most of the time. Tree growth is slow. Reestablishing stands of desirable trees in cutover areas is difficult. The hazard of windthrow is a serious concern in areas that are opened up by cutting.

Woodland Products

The number of trees harvested for woodland products each year is steadily increasing in the county. A high level of production can continue if the woodland is properly managed. The more important woodland products in the county are described in the following paragraphs.

Pulpwood.—Most of the pulpwood is taken from cuttings in small tracts of federally owned land or from private property. Aspen and jack pine are the most common trees cut for pulp. Spruce, balsam fir, and hemlock also are cut. The county has the potential for producing a large amount of pulpwood. Most of the privately owned woodland tracts are too small for logging operations. Owners of several adjoining tracts, however, could combine their logging operations.

Lumber.—An increasing amount of timber is being

Figure 13.—The Huron National Forest provides about 112,000 acres of forested recreational land in Iosco County. This land also provides woodland products and wildlife habitat.

harvested for sawlogs in the county. The trees in most wooded areas are relatively young; most are pole or sapling size. Most of the large, high-quality trees have been removed, and most of the remaining larger trees are of poor quality and cannot be used for lumber. Only a few areas support many high-quality trees of sawlog size. Northern hardwood stands generally should be culled or thinned, or both. Most pine plantations should be thinned (fig. 14). Northern red oak and red pine are cut mainly for lumber. Aspen is cut for pallet material.

Firewood.—Many homes use firewood as either the

main source or a supplementary source of heat. Wood chips are good fuel. The entire tree can be used for this purpose. Oak and maple are most commonly used as firewood, but most trees have some value for this use.

Poles and posts.—The numerous red pine and jack pine plantations that should be thinned are a good potential source of treated poles and posts. In some of the wet areas, northern whitecedar also is a potential source of posts.

Woodland recreational uses.—The extensive woodland in the county, particularly the large amount on public lands, provides recreational opportunities throughout the year.

The Natural Resources Conservation Service, the Michigan Department of Natural Resources, the Cooperative Extension Service, and consulting foresters can help to determine specific woodland management needs.

Management for wood crops on the different kinds of soil in the survey area varies, but it is governed mainly by the species in the stand. One management alternative might favor northern hardwood species using an uneven-aged approach. Another management alternative might favor aspen and white birch using an even-aged approach. Management should include controlling erosion, planting trees where natural regeneration is undesirable or insufficient, controlling vegetation that competes with natural or planted regeneration, improving the seedling survival rate, minimizing windthrow on the wetter sites, harvesting in a timely manner, controlling damage by insects and

Figure 14.—A red pine plantation in an area of Morganlake sand, 0 to 6 percent slopes. Thinning can increase pole size in these areas.

diseases, removing cull trees and undesirable species, and maintaining optimum basal area.

Damage from erosion may occur as a result of site preparation for planting and as a result of cutting operations where the soil is exposed along logging roads, stream crossings, and fire lanes and in landing areas. Forests abused by fire also may be subject to erosion. Erosion is generally a hazard on forest land in areas where slopes are 18 percent or more. Locating logging roads and skid roads on the contour reduces the hazard of erosion.

Soil wetness is the result of a high water table, flooding, or ponding. Soil wetness causes seedling mortality, limits the use of equipment, increases the invasion or growth of undesirable plants following harvest, and increases the likelihood of windthrow by restricting the rooting depth of some trees. Ruts form easily on some soils when wheeled skidders are used during wet periods. Deep ruts tend to restrict lateral drainage, damage tree roots, and alter soil structure and can result in a species change and reduced yields. Wetness can be overcome by restricting woodland operations to seasons of the year when the soils are dry or frozen or have adequate snow cover.

Soil droughtiness, or insufficient moisture, may also cause seedling mortality. Steep, south- and west-facing slopes may be especially droughty because of high insolation and evaporation rates on these sites. Planting during moist soil conditions can minimize seedling losses. Seedling survival during dry seasons can be improved by planting large, vigorous nursery stock or containerized seedlings if natural regeneration is undesirable or insufficient. Special site preparation, such as furrowing, may also be needed. In very dry areas, using containerized planting stock may be necessary.

The slope can limit the use of forestry equipment. In areas where slopes are 18 percent or more, the use of equipment is generally limited in logging areas and on skid trails and logging roads. Placing logging roads and skid trails on the contour helps to overcome the slope. The slope also influences the location of landings and log-handling areas. Nearly level and undulating areas provide the best locations for such sites.

Tables 7 and 8 provide information about soil characteristics that affect woodland management in Iosco County. Only those soils suitable for wood crops are listed. Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Table 8 gives information about operating harvesting or thinning equipment in logging areas and on skid roads, log landings, and haul roads.

Table 7 lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce in a pure stand under natural conditions. The number 1 indicates low potential productivity; 2 or 3, moderate; 4 or 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excess water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; *F*, a high content of rock fragments in the soil; *L*, low strength; and *N*, snowpack. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, F, L, and N.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, and fire lanes and in log-handling areas. Forests that have been burned or overgrazed are also subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *slight* indicates that under normal conditions the kind of equipment and season of use are not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1

to 3 months. A rating of *severe* indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

Plant competition ratings indicate the degree to which undesirable species are expected to invade and grow when openings are made in the tree canopy. The main factors that affect plant competition are depth to the water table and the available water capacity. A rating of *slight* indicates that competition from undesirable plants is not likely to prevent natural regeneration or suppress the more desirable species. Planted seedlings can become established without undue competition. A rating of *moderate* indicates that competition may delay the establishment of desirable species. Competition may hamper stand development, but it will not prevent the eventual development of fully stocked stands. A rating of *severe* indicates that competition can be expected to prevent regeneration unless precautionary measures are applied.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *productivity class*. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *productivity class*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic meters per hectare per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand (USDA, National Forestry Manual).

Trees to plant are those that are suitable for commercial wood production.

In table 8, limitations are given for the most limiting season and for the preferred operating season. The most limiting season in this survey area generally is spring or late fall. In some areas, however, it is during dry periods in summer, when loose sand can limit trafficability on deep, well drained, sandy soils.

The preferred operating season is the period when harvesting or thinning causes the least amount of soil damage. This period generally is when the soil is not too wet or when the ground is frozen or partly frozen or has an adequate snow cover.

In table 8, a rating of *slight* indicates that the use of conventional logging equipment is not restricted if normal logging methods are used. A rating of *moderate* indicates that the use of equipment is restricted because of one or more soil factors. If wetness is a limitation, high flotation equipment or special procedures may be needed to prevent the formation of ruts. A rating of *severe* indicates that the kind of equipment that can be used is seriously restricted.

Logging areas and skid roads include areas where some or all of the trees are being cut. Generally, equipment traffic is least intensive in the logging areas. Skid roads, which generally are within the logging areas, are roads or trails over which the logs are dragged or hauled from the stump to a log landing.

Log landings are areas where logs are assembled for transportation. Wheeled equipment may be used more frequently in these areas than in any other areas affected by logging.

Haul roads are access roads leading from primary or surfaced roads to the logging areas. The logging roads serve as transportation routes for wheeled logging equipment and logging trucks. Generally, they are unpaved roads. Some are graveled.

Plant Communities

Table 9 lists plants that are typically associated with the soils in the survey area. The information in table 9 is based on sample sites. Sample sites were selected for vegetative analysis after detailed soil maps and soil series descriptions were completed in an area. Once the soils were verified, representative vegetative communities were selected in areas that were relatively free from recent disturbances, such as fire, tree harvesting, or noticeable insect or disease infestations. The sample sites were in areas that exhibited typical stocking densities.

The plots sampled were approximately 10,000 square feet. Plant species were identified and recorded and an ocular estimate made of the percent coverage for each species. Tree species were recorded by estimating the percent canopy coverage, and other plants were recorded by estimating the percent ground coverage. For the purposes of facilitating compilation and clarifying the results, coverage values were grouped into seven classes. The seven classes are: *1*—less than 1 percent coverage; *2*—1 to 5 percent coverage; *3*—5 to 25 percent coverage; *4*—25 to 50 percent coverage; *5*—50 to 75 percent coverage; *6*—75 to 95 percent coverage; and *7*—95 to 100 percent coverage (Pregitzer and others, 1987).

The number that follows each plant species in table 9 represents the mean coverage class for that species for the map unit or soil listed. This number can be correlated to the relative dominance of overstory and understory vegetation. Plants that have a high number cover more of the canopy or ground than those that have a low number.

The plants listed in table 9 for each map unit are a composite of two to ten sites. They are considered the plants that are typical in areas of a map unit, but they are not the only plants that may occur. Only common names are used for the plants in table 9 (USDA, National List of Common Plant Names).

Plant Associations

The Ecological Classification System (ECS) for the Huron-Manistee National Forests (Cleland and others) was developed for National Forest System information needs. These needs include delineating land units for planning analyses, predicting vegetative structure and the distribution of wildlife habitat, planning desired future conditions within and across geologic regions for conservation of biological diversity, and evaluating ecological processes, such as forest succession or soil productivity. The overall purpose of the ECS is to provide an ecological framework for integrated resource planning and management.

The ECS is an ecological approach to defining biological potential of the National Forest land base. Multiple ecological factors were used to define the classification and map units. Climate, landform, soil, and vegetation information was integrated before map units were described and delineated. Information regarding vegetation and soils was predominantly used to delineate map units in the field.

Plant associations are used in the mapping process to help identify local map units. Plant associations are combinations of late successional overstories and groups of associated understory and ground flora species. Species groups are associated with the map unit. Species composition may vary within the map units, however, and any given species within a species group may not occur at a particular place. In some cases the plant association does not reflect soil characteristics and potential. In landscapes that do not support diagnostic plant communities because of natural variability or disturbance, soil and landform variables serve alone as differentiating map unit criteria.

Plant associations have been determined for each map unit in the survey area. The primary plant association and secondary plant association are specified at the end of some map unit descriptions in the section "Detailed Soil Map Units." These associations represent the plants that are the most diagnostic for the landforms and soils of the map unit. The following paragraphs describe the plant associations in the survey area. They provide information about the landform and soil type on which the plants occur, the potential late successional overstory and the diagnostic understory, and the ground flora species characteristic of the association.

Plant Association 1—Black oak (*Quercus velutina*)-White oak (*Quercus alba*)-Blueberry (*Angustifolium*)

This association is characteristic of dry, nutrient-poor landscapes in areas of sandy soils. Potential late successional natural vegetation includes species that have adapted to harsh conditions and frequent fire disturbance and is represented by overstory species of black oak (*Quercus velutina*), white oak (*Quercus alba*), and northern pin oak (*Quercus ellipsoidalis*). Distinguishing ground flora and understory species include blueberry (*Vaccinium angustifolium*), cowwheat (*Melampyrum lineare*), trailing arbutus (*Epigaea repens*), huckleberry (*Gaylussacia baccata*),

brackenfern (*Pteridium aquilinum*), red maple (*Acer rubrum*) seedlings, and oak (*Quercus* spp.) seedlings.

Plant Association 2—Mixed oak (*Quercus* spp.)-Red maple (*Acer rubrum*)-Starflower (*Trientalis borealis*)

This association is primarily in areas of sandy soils that exhibit weak spodic development. Potential late successional overstory species include black oak (*Quercus velutina*), white oak (*Quercus alba*), northern red oak (*Quercus rubra*), red maple (*Acer rubrum*), red pine (*Pinus resinosa*), and eastern white pine (*Pinus strobus*). Distinguishing ground flora and understory species include mapleleaf viburnum (*Viburnum acerifolium*), brackenfern (*Pteridium aquilinum*), wintergreen (*Gaultheria procumbens*), starflower (*Trientalis borealis*), blueberry (*Vaccinium angustifolium*), red maple (*Acer rubrum*) seedlings and saplings, and juneberry species (*Amelanchier* spp.).

Plant Association 3—Northern red oak (*Quercus rubra*)-Red maple (*Acer rubrum*)-Mapleleaf viburnum (*Viburnum acerifolium*)

This association is primarily on sandy morainal landscapes and in areas of well developed soils on lake plains. Potential late successional overstory species include northern red oak (*Quercus rubra*), red maple (*Acer rubrum*), and eastern white pine (*Pinus strobus*). Distinguishing ground flora and understory species include mapleleaf viburnum (*Viburnum acerifolium*), sarsaparilla (*Aralia nudicaulis*), lily of the valley (*Maianthemum canadense*), large-leaved aster (*Aster macrophyllus*), squaw root (*Conopholis americana*), red maple (*Acer rubrum*) seedlings and saplings, and witchhazel (*Hamamelis virginiana*).

Plant Association 4—Northern red oak (*Quercus rubra*)-Red maple (*Acer rubrum*)-Trefoil (*Desmodium* spp.)

This association is primarily on moraines and lake beds that have deposits of sand overlying fine loamy materials. Potential late successional overstory species include northern red oak (*Quercus rubra*), red maple (*Acer rubrum*), sugar maple (*Acer saccharum*), black cherry (*Prunus serotina*), and white ash (*Fraxinus americana*). Distinguishing ground flora and understory species include trefoils (*Desmodium* spp.), downy yellow violet (*Viola pubescens*), flowering dogwood (*Cornus florida*), black cherry (*Prunus serotina*) seedlings, sugar maple (*Acer saccharum*) seedlings, mapleleaf viburnum (*Viburnum acerifolium*), and red maple (*Acer rubrum*) seedlings.

Plant Association 5—Sugar maple (*Acer saccharum*)-American beech (*Fagus grandifolia*)-Clubmoss (*Lycopodium obscurum, L. lucidulum*)

This association is on sandy moraines and sandy lake plains in areas of soils that have dark horizons in the subsoil. Potential late successional overstory species include sugar maple (*Acer saccharum*), American beech (*Fagus grandifolia*), northern red oak (*Quercus rubra*), and red maple (*Acer rubrum*). The association is characterized by low diversity and coverage of ground flora along the forest floor. Distinguishing understory and ground flora species include lily of the valley (*Maianthemum canadense*), clubmosses (*Lycopodium obscurum and L. lucidulum*), true Solomons seal (*Polygonatum biflorum*), longstalk sedge (*Carex pedunculata*), and sugar maple (*Acer saccharum*) seedlings.

Plant Association 6—Sugar maple (*Acer saccharum*)-White ash (*Fraxinus americana*)-Sweet cicely (*Osmorhiza claytoni*)

This association is in areas of coarse over fine textured soils on moraines, till plains, and lake beds. Potential late successional overstory species include sugar maple (*Acer saccharum*), white ash (*Fraxinus americana*), American basswood (*Tilia americana*), eastern hemlock (*Tsuga canadensis*), black cherry (*Prunus serotina*), and northern red oak (*Quercus rubra*). The association is characterized by diverse and abundant ground flora on the forest floor. Distinguishing understory and ground flora species include sweet cicely (*Osmorhiza claytoni*), wild leek (*Allium tricoccum*), false miterwort (*Tiarella cordifolia*), true miterwort (*Mitella diphylla*), Canada white violet (*Viola canadensis*), bellwort (*Uvularia perfoliata*), grapefern (*Botrychium virginianum*), blue cohosh (*Caulophyllum thalictroides*), sugar maple (*Acer saccharum*) seedlings, and white ash (*Fraxinus americana*) seedlings.

Plant Association 7—Northern red oak (*Quercus rubra*)-Red maple (*Acer rubrum*)-Leatherleaf (*Chamaedaphne calyculata*)-Blueberry (*Vaccinium angustifolium*)

This association is in areas of poorly drained, acidic sand deposits on outwash plains and lake plains. Potential late successional overstory species include northern red oak (*Quercus rubra*), black oak (*Quercus velutina*), white oak (*Quercus alba*), red maple (*Acer rubrum*), and eastern white pine (*Pinus strobus*). The association is characterized by species adapted to

acidic and frequent anaerobic soil conditions. Distinguishing understory and ground flora species include leatherleaf (*Chamaedaphne calyculata*), blueberry (*Vaccinium angustifolium*), Labrador tea (*Ledum groenlandicum*), wintergreen (*Gaultheria procumbens*), dewberry (*Rubus* spp.), brackenfern (*Pteridium aquilinum*), and speckled alder (*Alnus rugosa*).

Plant Association 8—Red maple (*Acer rubrum*)-Balsam fir (*Abies balsamea*)-Bunchberry (*Cornus canadensis*)

This association is on outwash plains, flood plains, and lake plains in areas of sandy deposits that are slightly acid to alkaline. Potential late successional overstory species include red maple (*Acer rubrum*), black ash (*Fraxinus nigra*), green ash (*Fraxinus pennsylvanica*), balsam fir (*Abies balsamea*), and eastern white pine (*Pinus strobus*). Distinguishing understory and ground flora species include lily of the valley (*Maianthemum canadense*), bunchberry (*Cornus canadensis*), goldthread (*Coptis groenlandica*), wintergreen (*Gaultheria procumbens*), and shield fern (*Dryopteris spinulosa*).

Plant Association 9—Mixed ash (*Fraxinus* spp.)-Basswood (*Tilia americana*)-Downy yellow violet (*Viola pubescens*)

This association is in areas of poorly drained, nutrient-rich, loamy soils on lake beds, till plains, and flood plains. The organic deposits are shallow. Potential late successional overstory species include American basswood (*Tilia americana*), eastern hemlock (*Tsuga canadensis*), black ash (*Fraxinus nigra*), green ash (*Fraxinus pennsylvanica*), and northern whitecedar (*Thuja occidentalis*). Distinguishing understory and ground flora species include downy yellow violet (*Viola pubescens*), maidenhair fern (*Adiantum pedatum*), cinnamon fern (*Osmunda cinnamomea*), jack in the pulpit (*Arisaema triphyllum*), and bellwort (*Uvularia perfoliata*).

Plant Association 10—Black spruce (*Picea mariana*)-Tamarack (*Larix laricina*)-Labrador tea (*Ledum groenlandicum*)

This association is in areas of poorly drained, dysic organic deposits on outwash plains and lake plains. The organic deposits are deep. The association is characterized by acid bog conditions. Overstory is sparse, and black spruce (*Picea mariana*) and tamarack (*Larix laricina*) are the predominant species. Distinguishing understory and ground flora species include Labrador tea (*Ledum groenlandicum*), leatherleaf (*Chamaedaphne calyculata*), sphagnum (*Sphagnum* spp.), and speckled alder (*Alnus rugosa*).

Plant Association 11—Northern whitecedar (*Thuja occidentalis*)-Eastern hemlock (*Tsuga canadensis*)-Canada violet (*Viola canadense*)

This association is in areas of poorly drained, euic organic deposits on flood plains, till plains, and lake beds. The organic deposits are deep. Potential late successional overstory species include northern whitecedar (*Thuja occidentalis*), eastern hemlock (*Tsuga canadensis*), white spruce (*Picea glauca*), and black ash (*Fraxinus nigra*). Distinguishing understory and ground flora species include Canada violet (*Viola canadense*), maidenhair fern (*Adiantum pedatum*), bedstraws (*Galium* spp.), and lily of the valley (*Maianthemum canadense*).

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 10 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 10 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from the local office of the Natural Resources Conservation Service or of the Extension Service or from a commercial nursery.

Recreation

Recreation is a major land use in Iosco County. Most of the land in the county is used for nonintensive recreational purposes, such as fishing, hunting, canoeing, camping, hiking, and sightseeing. Winter activities include cross-country skiing and snowmobiling. Many areas are developed for intensive recreational uses, such as parks, campgrounds, and picnic areas. Because of an expanding population and increasing amounts of leisure time, land use is certain to undergo changes in the future. More land is likely to be converted to various types of recreational areas.

The soils of the survey area are rated in table 11 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation also are important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 11, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or a combination of these measures.

The information in table 11 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 14 and interpretations for dwellings without basements and for local roads and streets in table 13.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Iosco County has a variety of wildlife. The principal species are white-tailed deer, black bear, gray squirrels, fox squirrels, cottontail rabbits, snowshoe hares, bobcats, wild turkeys, ruffed grouse, and various other birds. The north-central part of the county is managed for Kirtland's warbler habitat (fig. 15).

Many lakes and streams in the county provide good fishing for trout, northern pike, largemouth bass, walleye, and a variety of other game fish.

Habitat for wildlife in the county ranges from farmland to northern hardwood climax forests. Much of the habitat can be improved by establishing more

Figure 15.—Jack pine in an area of Grayling sand, nearly level and undulating. This area has been designated as Kirtland's warbler habitat. It supports nesting pairs of this endangered species.

water areas and by increasing the extent of vegetation that provides food and cover.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting

appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 12, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture also are considerations. Examples of grain and seed crops are corn, wheat, oats, rye, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture also are considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture also are considerations. Examples of wild herbaceous plants are bluestem, violets, ragweed, wintergreen, and bunchberry.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, aspen, cherry, beech, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, and cedar.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, cattail, bog laurel, leatherleaf, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include woodchuck, ground squirrel, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous and/or coniferous plants and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife

attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 13 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without

basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, and the available water capacity in the upper 40 inches affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 14 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 14 also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 14 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, bedrock or a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter

is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. Ratings in table 14 are for area landfills. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Areas used for a sanitary landfill must be able to bear heavy vehicular traffic. The use of a soil as landfill involves a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in table 14 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding are considerations affecting area landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. Onsite investigation may be needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 15 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 15, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil),

the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are naturally fertile or respond well to fertilizer, and they are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel or stones, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 16 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, and sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones or depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone and soil reaction.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Some map units, mainly those in the Huron National Forest, were designed differently from the map units in other parts of the survey area. Information for these map units may not be included in some of the tables associated with this section of the survey.

Engineering Index Properties

Table 17 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 1998) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 1998).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches in diameter

and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 18 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to

very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; *high*, 6 to 9 percent; and *very high*, greater than 9 percent.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.10 to 0.43. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. The soils assigned to group 1 are the most susceptible to soil blowing, and those assigned to group 8 are the least susceptible. The groups are as follows:

1. Coarse sands, sands, fine sands, and very fine sands.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, ash material, and sapric soil material.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material.

8. Soils that are not subject to soil blowing because of coarse fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 18, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Tables 19 and 20 give estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

In table 19, *hydrologic soil groups* are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in table 19, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is

caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Table 19 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of flooding is more than 50 percent in any year). *Common* is used when the occasional and frequent classes are grouped for certain purposes. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on observations of the water table at selected sites and on the evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. Indicated in table 19 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 19.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. "More than 6.0" indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

In table 20, *depth to bedrock* is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence generally results from either desiccation and shrinkage or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. Table 20 shows the expected initial subsidence, which usually is a result of drainage, and total subsidence, which results from a combination of factors.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the

soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low, moderate,* or *high.* It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Soil Characterization Data for Selected Soils

Many of the soils in Iosco County were sampled for physical and chemical analyses by the National Soil Survey Laboratory in Lincoln, Nebraska. The laboratory data obtained from the soil samples included analyses of particle-size distribution, coarse fragments, bulk density, and moisture retention. Complete chemical analyses were also performed on each sample, and spodic horizon criteria were determined on the appropriate samples. These data were used in classifying and correlating the soils and in evaluating their behavior, especially under forestry uses. Five profiles were selected as representative of their series, and two were sampled for their unique characteristics. These pedons and their laboratory identification numbers are as follows: Algonquin (S92MI-069-002), Manary (S93MI-069-003), Deer Park (S93MI-069-006), Springport (S93MI-069-002 and S93MI-069-007), Nester (S92MI-069-001 and S93MI-069-004), and Whittemore (S93MI-069-001).

In addition to the Iosco County data, soil characterization data and forest site data are available from nearby counties that have many of the same soils. These data and the data from Iosco County are available from the National Soil Survey Laboratory, the Environmental Stewardship Division of the Michigan Department of Agriculture, and the Natural Resources Conservation Service.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (USDA, 1999 and 1994). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 21 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Spodosol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Orthod (*Orth*, meaning the common ones, plus *od*, from Spodosol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplorthods (*Hapl*, meaning minimal horizonation, plus *orthods*, the suborder of the Spodosols that has a horizon of accumulation of aluminum, iron, and organic carbon in which no one of the elements dominates).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. An example is Entic Haplorthods.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle size, mineral content, soil temperature regime, soil depth, and reaction. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is sandy, mixed, frigid Entic Haplorthods.

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile.

Soil Series and Their Morphology

In this section, each soil series and higher taxonomic unit recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each series or higher taxonomic unit. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (USDA, 1993). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (USDA, 1999) and in "Keys to Soil Taxonomy" (USDA, 1994). Unless otherwise indicated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in each series or higher taxonomic unit.

Alfic Haplorthods, Sandy

The taxonomic classification of these soils is sandy, mixed, frigid Alfic Haplorthods. The soils are well drained and are on end moraines and ground

moraines. Permeability is rapid. These soils formed in sandy and loamy glacial till. Slopes range from 0 to 50 percent.

Reference pedon of Alfic Haplorthods, sandy, in an area of Alfic Haplorthods, sandy over loamy-Alfic Haplorthods, sandy, complex, rolling, approximately 2,440 feet north and 1,490 feet east of the southwest corner of sec. 19, T. 27 N., R. 5 E.; USGS McKinley topographic quadrangle; lat. 44 degrees 43 minutes 5 seconds N. and long. 83 degrees 52 minutes 58 seconds W.; in Alcona County:

Oe—0 to 2 inches; black (10YR 2/1), partially decomposed hardwood leaf litter.

A—2 to 4 inches; very dark grayish brown (10YR 3/2) sand, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; many very fine and fine roots; moderately acid; clear irregular boundary.

E—4 to 7 inches; grayish brown (10YR 5/2) sand, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; many fine roots; moderately acid; clear irregular boundary.

Bs1—7 to 11 inches; dark brown (7.5YR 4/4) sand; weak medium subangular blocky structure; friable; moderately acid; gradual wavy boundary.

Bs2—11 to 32 inches; strong brown (7.5YR 5/6) sand; weak fine subangular blocky structure; very friable; moderately acid; gradual wavy boundary.

Bw—32 to 37 inches; reddish yellow (7.5YR 6/6) sand; single grain; loose; moderately acid; clear irregular boundary.

2Bt—37 to 42 inches; dark brown (7.5YR 4/4) sandy loam; weak medium subangular blocky structure; very friable; dark brown (7.5YR 4/4) clay films on faces of peds; slightly acid; clear wavy boundary.

3C1—42 to 77 inches; reddish yellow (7.5YR 6/6) sand; single grain; loose; neutral; gradual wavy boundary.

3C2—77 to 180 inches; brownish yellow (10YR 6/6) sand; single grain; loose; neutral.

The depth to loamy material ranges from 20 to 45 inches. The content of gravel ranges from 0 to 15 percent throughout the profile.

The A horizon has hue of 10YR, value of 2 to 4, and chroma of 1 or 2. It is dominantly loamy sand, but the range includes sand.

The E horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 2 or 3. It is sand or loamy sand. Some pedons have discontinuous E horizons.

The Bs horizon has hue of 7.5YR or 10YR and value and chroma of 4 to 6. It is sand or loamy sand. The Bw horizon also is sand or loamy sand.

The 2Bt horizon has hue of 5YR or 7.5YR and value and chroma of 3 to 6. It is sandy loam, fine sandy loam, sandy clay loam, or silt loam. If the 2Bt horizon is above a depth of 40 inches, it is less than 6 inches thick. If this horizon is below a depth of 40 inches, the thickness ranges to 30 inches.

The 3C horizon has hue of 7.5YR or 10YR, value of 6 or 7, and chroma of 3 to 6. It is sand, coarse sand, or loamy sand. Some pedons have bands, less than 6 inches thick, of sandy loam, sandy clay loam, fine sandy loam, silt loam, or silty clay loam.

Alfic Haplorthods, Sandy Over Loamy

The taxonomic classification of these soils is sandy over loamy, mixed, frigid Alfic Haplorthods. The soils are well drained and are on ice-contact end moraines and ground moraines. They consist of sandy material overlying loamy and sandy material and formed in sandy and loamy glacial till. Permeability is rapid in the sandy material and moderate or moderately slow in the loamy material. Slopes range from 0 to 18 percent.

Reference pedon of Alfic Haplorthods, sandy over loamy, in an area of Alfic Haplorthods, sandy over loamy-Alfic Haplorthods, sandy, complex, rolling, 800 feet south and 1,200 feet east of the northwest corner of sec. 8, T. 26 N., R. 5 E.; USGS Curran topographic quadrangle; lat. 44 degrees 39 minutes 47 seconds N. and long. 83 degrees 51 minutes 47 seconds W.; in Alcona County:

Oe—0 to 2 inches; black (10YR 2/1), partially decomposed hardwood leaf litter.

A—2 to 4 inches; black (10YR 2/1) sand, dark gray (10YR 4/1) dry; weak fine granular structure; very friable; many very fine and fine and common medium roots; moderately acid; clear wavy boundary.

E—4 to 6 inches; dark grayish brown (10YR 4/2) sand, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; many very fine and few medium and coarse roots; moderately acid; clear wavy boundary.

Bs1—6 to 9 inches; dark brown (7.5YR 4/4) sand; weak medium granular structure; very friable; many fine and few medium and coarse roots; strongly acid; clear smooth boundary.

Bs2—9 to 27 inches; strong brown (7.5YR 5/6) sand; weak fine granular structure; friable; many very fine and fine and few medium and coarse roots; moderately acid; gradual wavy boundary.

2Bt—27 to 44 inches; brown (7.5YR 5/4) sandy clay loam; moderate medium subangular blocky

structure; firm; dark brown (7.5YR 4/4) clay films on faces of peds; common fine roots; neutral; abrupt wavy boundary.

3C1—44 to 52 inches; yellowish brown (10YR 5/6) loamy sand; weak fine granular structure; very friable; neutral; gradual wavy boundary.

3C2—52 to 120 inches; brownish yellow (10YR 6/6) sand; single grain; loose; neutral.

The thickness of the solum ranges from 20 to 50 inches. The thickness of the sandy deposits ranges from 20 to 40 inches. The content of gravel ranges from 0 to 10 percent in the sandy material and from 0 to 15 percent in the Bt and C horizons.

The A horizon has hue of 10YR, value of 2 to 4, and chroma of 1 or 2. It is dominantly sand, but the range includes loamy sand.

The E horizon has hue of 10YR or 7.5YR, value of 4 to 7, and chroma of 2 to 4. It is sand or loamy sand.

The Bs1 horizon has hue of 7.5YR or 5YR, value of 3 to 5, and chroma of 3 or 4. It is sand or loamy sand.

The Bs2 horizon has hue of 7.5YR or 5YR and value and chroma of 4 to 6. It is sand or loamy sand.

Some pedons have a BC horizon. This horizon is as much as 10 inches thick. It is loamy sand or sand.

The 2Bt horizon has hue of 5YR or 7.5YR and value and chroma of 3 to 6. It is sandy clay loam, clay loam, silt loam, or silty clay loam. The content of fine sand and coarser sand is 5 to 50 percent. The content of clay ranges from 18 to 35 percent.

The 3C horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 4 to 6. It is sand, loamy sand, loamy fine sand, fine sand, or sandy loam. Some pedons have strata of sandy clay loam, silt loam, or silty clay loam. These strata are less than 3 inches thick.

Algonquin Series

The Algonquin series consists of somewhat poorly drained soils that formed in silty and clayey lacustrine deposits. These soils are on lake plains. Permeability is very slow. Slopes range from 0 to 6 percent.

Typical pedon of Algonquin clay (fig. 16), in an area of Algonquin-Springport complex, 0 to 3 percent slopes, 1,300 feet south and 120 feet east of the northwest corner of sec. 22, T. 21 N., R. 7 E.; USGS Alabaster topographic quadrangle; lat. 44 degrees 12 minutes 12.29 seconds N. and long. 83 degrees 34 minutes 52.52 seconds W.; in Alabaster Township:

Ap—0 to 9 inches; 80 percent very dark grayish brown (10YR 3/2) clay, light brownish gray (10YR 6/2) dry; 20 percent dark brown (7.5YR 4/4) material from the B horizon; strong medium subangular blocky structure; friable; few medium and common fine and very fine roots; slightly effervescent; slightly alkaline; abrupt smooth boundary.

Bt1—9 to 13 inches; brown (7.5YR 5/4) clay; moderate medium prismatic structure parting to strong fine angular blocky; firm; few fine to coarse roots; common distinct grayish brown (10YR 5/2) skeletans on vertical faces of peds; more than 1 percent oriented clay observed in thin section; many medium prominent brownish yellow (10YR 6/6) masses of iron accumulation and many fine prominent greenish gray (5GY 6/1) and many fine distinct reddish brown (5YR 5/3) masses of iron depletions; strongly effervescent; moderately alkaline; clear smooth boundary.

Bt2—13 to 17 inches; reddish brown (5YR 4/3) silty clay; strong medium prismatic structure parting to strong medium and thick platy; firm; few fine to coarse roots; many distinct grayish brown (10YR 5/2) and gray (10YR 6/1) clay depletions on horizontal and vertical faces of peds; few distinct pinkish gray (7.5YR 7/2) lime coatings on horizontal and vertical faces of peds; common medium prominent yellowish brown (10YR 5/6) masses of iron accumulation and common fine prominent greenish gray (5GY 6/1) iron depletions; violently effervescent; moderately alkaline; clear smooth boundary.

BC1—17 to 32 inches; reddish brown (5YR 4/3) silty clay; strong medium and coarse prismatic structure parting to strong medium angular blocky; firm; common distinct gray (10YR 6/1) clay depletions on horizontal and vertical faces of peds; few distinct white (10YR 8/1) lime coatings on vertical faces of peds; many fine prominent greenish gray (5G 6/1) iron depletions and common medium prominent yellowish brown (10YR 5/4) masses of iron accumulation; violently effervescent; slightly alkaline; clear wavy boundary.

BC2—32 to 80 inches; reddish brown (5YR 5/3) silty clay; strong medium and coarse prismatic structure parting to strong fine and medium angular blocky; firm; many distinct light gray (N 7/0) clay depletions on vertical and horizontal faces of peds and few distinct white (7.5YR 8/0) lime coatings on vertical faces of peds; common medium prominent reddish yellow (7.5YR 6/6) masses of iron accumulation; violently effervescent; moderately alkaline.

The depth to free carbonates ranges from 11 to 13 inches. Reaction is slightly or moderately alkaline. The content of coarse fragments is less than 3 percent.

The Ap horizon has hue of 10YR or 7.5YR and

value of 2 or 3. It is silt loam, clay, or silty clay.

The Bt horizon has hue of 7.5YR or 5YR, value of 3 to 5, and chroma of 3 to 6. It is clay or silty clay. The clay content ranges from 35 to 60 percent.

The BC horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 3 or 4.

Allendale Series

The Allendale series consists of somewhat poorly drained soils that formed in sandy outwash over clayey lacustrine and till deposits. These soils are on lake plains and till plains. Permeability is rapid in the sandy material and very slow in the clayey deposits. Slopes range from 0 to 4 percent.

Typical pedon of Allendale loamy sand, 0 to 3 percent slopes, 800 feet north and 1,900 feet west of the southeast corner of sec. 5, T. 21 N., R. 6 E.; USGS National City topographic quadrangle; lat. 44 degrees 14 minutes 11.18 seconds N. and long. 83 degrees 43 minutes 40.69 seconds W.; in Sherman Township:

Ap—0 to 6 inches; very dark brown (10YR 2/2) loamy sand, light brownish gray (10YR 6/2) dry: weak medium subangular blocky structure; friable; many fine roots; extremely acid; abrupt smooth boundary.

E—6 to 8 inches; light brownish gray (10YR 6/2) sand, white (10YR 8/2) dry; moderate medium subangular blocky structure; friable; few fine roots; common medium distinct brownish yellow (10YR 6/6) and few fine prominent strong brown (7.5YR 5/8) masses of iron accumulation and common medium faint light gray (10YR 7/2) iron depletions; strongly acid; clear wavy boundary.

Bs1—8 to 11 inches; dark brown (7.5YR 3/4) sand; moderate medium subangular blocky structure; friable; few fine roots; few fine distinct strong brown (7.5YR 5/8) masses of iron accumulation and few medium prominent grayish brown (10YR 5/2) iron depletions; very strongly acid; clear wavy boundary.

Bs2—11 to 18 inches; strong brown (7.5YR 4/6) sand; weak medium subangular blocky structure; friable; common medium distinct yellowish red (5YR 4/6) and common coarse distinct dark yellowish brown (10YR 4/6) masses of iron accumulation; strongly acid; clear wavy boundary.

E′—18 to 32 inches; pale brown (10YR 6/3) sand, light yellowish brown (10YR 6/4) dry; single grain; loose; common coarse distinct yellowish brown (10YR 5/6) masses of iron accumulation; neutral; clear wavy boundary.

2Bt—32 to 36 inches; reddish brown (5YR 5/4) clay; moderate medium and coarse subangular blocky structure; very firm; few faint reddish brown (5YR 4/3) clay films on vertical faces of peds; common medium prominent strong brown (7.5YR 5/6) masses of iron accumulation and common fine prominent greenish gray (5G 6/1) iron depletions; neutral; clear wavy boundary.

2C1—36 to 43 inches; brown (7.5YR 5/4) clay; massive; very firm; common medium distinct strong brown (7.5YR 5/6) masses of iron accumulation and common fine prominent greenish gray (5GY 6/1) iron depletions; strongly effervescent; slightly alkaline; clear wavy boundary.

2C2—43 to 80 inches; weak red (2.5YR 5/2) clay; massive; very firm; few prominent white (10YR 8/1) carbonate coatings on vertical faces of peds; common medium distinct red (2.5YR 5/6) and common medium prominent yellowish brown (10YR 5/8) masses of iron accumulation and common medium prominent greenish gray (5GY 6/1) iron depletions; strongly effervescent; moderately alkaline.

The thickness of the sandy layers ranges from 20 to 40 inches. The depth to free carbonates ranges from 25 to 45 inches. The content of gravel ranges from 0 to 5 percent throughout the profile.

The Ap horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 3. It is loamy sand or sand. Some pedons have an A horizon, which has colors and textures similar to those of the Ap horizon.

The E horizon has value of 5 or 6 and chroma of 1 or 2.

The Bs2 horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6.

The E′ horizon has value of 5 or 6 and chroma of 3 or 4.

The 2Bt horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. It is clay or silty clay. The content of clay ranges from 40 to 60 percent. Some pedons have a Bt horizon directly above the 2Bt horizon. The Bt horizon, if it occurs, is sandy loam and is 2 to 4 inches thick.

The 2C horizon has hue of 2.5YR to 7.5YR, value of 5, and chroma of 2 to 4. It is clay or silty clay.

Aquents

Aquents consist of very poorly drained soils that formed in sandy material underlain by loamy till or lacustrine sediments. Permeability is rapid or moderately rapid in the upper part and moderately

slow in the lower part. Slopes range from 0 to 2 percent.

Reference pedon of Aquents, in an area of Histosols and Aquents, ponded, 2,600 feet north and 600 feet west of the southeast corner of sec. 13, T. 23 N., R. 7 E.; USGS Sid Town topographic quadrangle; lat. 44 degrees 23 minutes 19 seconds N. and long. 83 degrees 31 minutes 32 seconds W.; in Wilber Township:

Oa—0 to 3 inches; black (N 2/0) muck; weak fine subangular blocky structure; very friable; strongly acid; abrupt smooth boundary.

Bg—3 to 20 inches; gray (N 5/0) sand; single grain; loose; strongly acid; clear wavy boundary.

Cg—20 to 80 inches; light brownish gray (10YR 6/2) sand; single grain; loose; slightly acid.

The content of gravel ranges from 0 to 20 percent throughout the profile.

The Oa horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. It is muck, mucky sand, mucky loamy sand, mucky loamy fine sand, sand, loamy sand, loamy fine sand, sandy loam, or fine sandy loam.

The Bg horizon has hue of 7.5YR to 2.5Y or is neutral in hue. It has value of 4 to 6 and chroma of 0 to 3. It is sand, fine sand, loamy sand, or loamy fine sand.

The Cg horizon has hue of 5Y to 2.5YR, value of 4 to 6, and chroma of 1 to 6. It is sand, gravelly sand, or fine sand. Some pedons have a 2C horizon. This horizon, if it occurs, is sandy loam, gravelly sandy loam, fine sandy loam, loam, silt loam, clay loam, or silty clay loam.

Aquepts

Aquepts consist of poorly drained or very poorly drained soils that formed in sandy material underlain by loamy till or lacustrine sediments. Permeability is rapid or moderately rapid in the upper part and moderately slow in the lower part. Slopes range from 0 to 35 percent.

Reference pedon of Aquepts, in an area of Kawkawlin-Allendale-Aquepts complex, 0 to 4 percent slopes, 700 feet north and 1,400 feet east of the southwest corner of sec. 28, T. 24 N., R. 5 E.; USGS Hale topographic quadrangle; lat. 44 degrees 26 minutes 19 seconds N. and long. 83 degrees 50 minutes 27 seconds W.; in Plainfield Township:

A—0 to 8 inches; black (10YR 2/1) sandy loam, very dark gray (10YR 3/1) dry; weak fine granular structure; very friable; moderately acid; abrupt smooth boundary.

Bg—8 to 30 inches; grayish brown (10YR 5/2) clay loam; moderate medium subangular blocky structure; friable; common medium distinct yellowish brown (10YR 5/6) masses of iron accumulation; neutral; clear wavy boundary.

Cg—30 to 80 inches; light brownish gray (10YR 6/2) clay loam; massive; firm; moderately alkaline.

The depth to carbonates ranges from 27 to 35 inches. The content of gravel ranges from 0 to 5 percent throughout the profile.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. It is sandy loam, loam, clay loam, muck, mucky sand, mucky loamy sand, mucky loamy fine sand, sand, loamy sand, loamy fine sand, or fine sandy loam.

The Bg horizon has hue of 7.5YR to 2.5Y or is neutral in hue. It has value of 4 to 6 and chroma of 0 to 3. It is clay loam, sandy clay loam, loam, sandy loam, sand, fine sand, loamy sand, or loamy fine sand.

The Cg horizon has hue of 5Y to 2.5YR, value of 4 to 7, and chroma of 1 to 6. It is clay loam, clay, loam, fine sandy loam, silt loam, or silty clay loam.

Aquic Udipsamments

Aquic Udipsamments consist of somewhat poorly drained soils that formed in sandy alluvium. These soils are on flood plains. Permeability is rapid. Slopes range from 0 to 3 percent.

Reference pedon of Aquic Udipsamments, in an area of Borosaprists, euic-Fluvaquents-Aquic Udipsamments complex, nearly level, 1,500 feet north and 500 feet west of the southeast corner of sec. 31, T. 24 N., R. 9 E.; USGS Foote Site Village topographic quadrangle; lat. 44 degrees 25 minutes 05 seconds N. and long. 83 degrees 23 minutes 50 seconds W.; in Oscoda Township:

A—0 to 6 inches; black (10YR 2/1) sand, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; many fine to coarse roots; less than 5 percent coarse fragments; very strongly acid; abrupt smooth boundary.

C1—6 to 22 inches; brown (10YR 5/3) sand; weak medium subangular blocky structure; very friable; many fine to coarse roots; few medium faint light brownish gray (10YR 6/2) iron depletions and few medium distinct yellowish brown (10YR 5/6) masses of iron accumulation in the lower part of the horizon; less than 5 percent coarse fragments; very strongly acid; clear wavy boundary.

C2—22 to 45 inches; yellowish brown (10YR 5/4) sand; weak medium subangular blocky structure; very friable; many fine to coarse roots in the upper part; few medium distinct light brownish gray (10YR 6/2) iron depletions and few medium faint yellowish brown (10YR 5/6) masses of iron accumulation; few very dark gray (10YR 3/1) organic bands less than 1 inch thick; less than 5 percent coarse fragments; very strongly acid; clear wavy boundary.

C3—45 to 80 inches; grayish brown (10YR 5/2) sand; single grain; loose; few medium faint light brownish gray (10YR 6/2) iron depletions and common medium distinct yellowish brown (10YR 5/8) and common medium distinct dark yellowish brown (10YR 4/4) masses of iron accumulation; few very dark gray (10YR 3/1) organic bands less than 1 inch thick; very strongly acid.

The control section has variable textures within short horizontal distances. It is sand, fine sand, loamy sand, loamy fine sand, or coarse sand. There is an irregular decrease in carbon with increasing depth.

The A horizon has hue of 10YR or 7.5YR, value of 2 to 4, and chroma of 1 to 3.

The C horizons have hue of 5YR to 2.5Y or are neutral in hue. They have value of 2 to 6 and chroma of 0 to 6.

Arenic Eutroboralfs

The taxonomic classification of these soils is loamy, mixed Arenic Eutroboralfs. The soils are well drained and are on overwashed moraines, in glacial drainageways, and on outwash plains. They formed in stratified loamy and sandy material. Permeability is moderate in the loamy part of the profile and rapid in the sandy part. Slopes range from 0 to 6 percent.

Reference pedon of Arenic Eutroboralfs, loamy, nearly level and undulating, 2,040 feet south and 2,440 feet east of the northwest corner of sec. 24, T. 26 N., R. 7 E.; USGS Barton City topographic quadrangle; lat. 44 degrees 38 minutes 7 seconds N. and long. 83 degrees 32 minutes 7 seconds W.; in Alcona County:

Oe—0 to 2 inches; partially decomposed hardwood leaf litter.

A—2 to 4 inches; very dark gray (10YR 3/1) loamy sand, gray (10YR 5/1) dry; weak fine granular structure; very friable; many very fine and fine and few medium roots; moderately acid; clear irregular boundary.

E—4 to 6 inches; light brownish gray (10YR 6/2) sand, light gray (10YR 7/2) dry; weak fine granular structure; friable; many very fine and fine and common medium roots; moderately acid; abrupt wavy boundary.

Bw1—6 to 12 inches; dark yellowish brown (10YR 4/6) sand; weak medium subangular blocky structure; friable; common fine and medium roots; moderately acid; gradual smooth boundary.

Bw2—12 to 32 inches; yellowish brown (10YR 5/6) loamy sand; weak medium subangular blocky structure; friable; few fine and medium roots; moderately acid; abrupt irregular boundary.

2Bt1—32 to 37 inches; strong brown (7.5YR 4/6) sandy loam; weak medium subangular blocky structure; friable; common fine and medium roots; clay bridges between sand grains; slightly acid; abrupt wavy boundary.

2Bt2—37 to 47 inches; dark brown (7.5YR 4/4) sandy clay loam; moderate medium subangular blocky structure; firm; common very fine and fine roots; common faint dark brown (7.5YR 4/2) clay films on vertical faces of peds; neutral; abrupt wavy boundary.

3C1—47 to 72 inches; yellowish brown (10YR 5/6) loamy sand; weak fine granular structure; friable; moderately alkaline; clear wavy boundary.

3C2—72 to 80 inches; light yellowish brown (10YR 6/4) sand with strata of gravelly sand, fine sand, and loamy sand; moderately alkaline.

The thickness of the solum ranges from 20 to 45 inches. The content of gravel ranges from 10 to 20 percent in the 2Bt and 3C horizons. Reaction ranges from strongly acid to slightly acid above the 2Bt horizon and from slightly acid to moderately alkaline below the 2Bt horizon.

These soils typically have a sandy cap, 20 to 40 inches thick, overlying loamy materials. Stratified materials are commonly below the loamy materials.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. It is sand or loamy sand.

The E horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 or 3. It is sand or loamy sand.

The Bw horizon has hue of 7.5YR or 10YR and value and chroma of 4 to 6. It is sand or loamy sand.

The 2Bt horizon has hue of 5YR or 7.5YR, value of 3 to 5, and chroma of 3 or 4. It is sandy loam, fine sandy loam, loam, sandy clay loam, or clay loam. The content of clay averages 10 to 35 percent.

The 2C horizon, if it occurs, has hue of 5YR or 7.5YR, value of 5 or 6, and chroma of 3 or 4. It is sandy loam, fine sandy loam, loam, sandy clay loam, or clay loam.

The 3C horizon varies in color and texture. It is commonly stratified sands, loamy sands, or loams.

Argic Endoaquods

The taxonomic classification of these soils is mixed, frigid Argic Endoaquods. The soils are somewhat poorly drained and are on outwash plains and lake plains. They formed in sandy outwash or lacustrine materials. Permeability is rapid. Slopes range from 0 to 4 percent.

Reference pedon of Argic Endoaquods, 2,300 feet south and 250 feet east of the northwest corner of sec. 7, T. 25 N., R. 8 E.; USGS Sprinkler Lake topographic quadrangle; lat. 44 degrees 34 minutes 37 seconds N. and long. 84 degrees 31 minutes 21 seconds W.; in Alcona County:

Oe—0 to 2 inches; black (10YR 2/1), partially decomposed leaf litter; many very fine and fine roots.

A—2 to 5 inches; very dark gray (10YR 3/1) sand, gray (10YR 5/1) dry; weak medium granular structure; very friable; many fine and common medium roots; moderately acid; clear wavy boundary.

E—5 to 10 inches; light brownish gray (10YR 6/2) sand, light gray (10YR 7/2) dry; weak medium granular structure; very friable; many fine and common medium roots; moderately acid; abrupt irregular boundary.

Bs—10 to 22 inches; dark brown (7.5YR 4/4) sand; weak medium subangular blocky structure; friable; few medium roots; few fine distinct strong brown (7.5YR 4/6) iron accumulations; moderately acid; clear wavy boundary.

Bt—22 to 37 inches; strong brown (7.5YR 5/6) loamy sand; weak medium subangular blocky structure; friable; few medium roots; common medium distinct strong brown (7.5YR 4/6) iron accumulations; few clay bridges between sand grains; moderately acid; clear wavy boundary.

C—37 to 80 inches; yellowish brown (10YR 5/4) sand; single grain; loose; slightly acid.

The thickness of the solum ranges from 20 to 40 inches. The content of gravel ranges from 0 to 15 percent. Reaction ranges from strongly acid to neutral in the solum and from moderately acid to moderately alkaline below the solum.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2.

The E horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 1 to 3.

The Bs horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 3 to 6. It is sand or loamy sand.

The Bt horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6.

The C horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 2 to 6. It is sand or loamy sand.

Au Gres Series

The Au Gres series consists of somewhat poorly drained soils that formed in sandy outwash deposits. These soils are on outwash plains, lake terraces, and stream terraces. Permeability is rapid. Slopes range from 0 to 4 percent.

Typical pedon of Au Gres sand, in an area of Au Gres-Deford complex, 0 to 3 percent slopes, 2,100 feet south and 1,800 feet east of the northwest corner of sec. 7, T. 21 N., R. 6 E.; USGS Whittemore topographic quadrangle; lat. 44 degrees 13 minutes 41.47 seconds N. and long. 83 degrees 45 minutes 38.45 seconds W.; in Sherman Township:

Oe—0 to 3 inches; black (N 2/0), partially decomposed leaf litter, black (N 2/0) dry; clear smooth boundary.

E—3 to 9 inches; pinkish gray (7.5YR 6/2) sand, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; common fine and medium and few coarse roots; common medium distinct light brownish gray (10YR 6/2) iron depletions; extremely acid; clear wavy boundary.

Bhs—9 to 11 inches; dark reddish brown (5YR 3/3) sand; weak medium subangular blocky structure; very friable; common fine and medium and few coarse roots; common medium distinct yellowish red (5YR 4/6) masses of iron accumulation; extremely acid; clear wavy boundary.

Bs—11 to 14 inches; dark brown (7.5YR 4/4) sand; weak fine granular structure; very friable; common fine and medium and few coarse roots; few fine distinct pinkish gray (7.5YR 6/2) iron depletions; extremely acid; gradual wavy boundary.

BC—14 to 29 inches; yellowish brown (10YR 5/6) sand; single grain; loose; few fine roots; common medium distinct light yellowish brown (10YR 6/4) masses of iron accumulation; extremely acid; gradual wavy boundary.

C—29 to 80 inches; very pale brown (10YR 7/3) sand; single grain; loose; few fine roots in the upper 20 inches; very strongly acid.

The depth to the C horizon ranges from 24 to 37 inches. The content of gravel ranges from 0 to 5 percent throughout the profile.

The E horizon has hue of 7.5YR or 10YR, value of 4 to 7, and chroma of 1 to 3. Some pedons have an A horizon, which has hue of 10YR, value of 2 or 3, and chroma of 1 or 2.

The Bhs horizon has chroma of 2 or 3. The content of ortstein ranges from 0 to 45 percent. Some pedons do not have a Bhs horizon.

The Bs horizon has hue of 10YR to 5YR, value of 3 to 6, and chroma of 4 to 6. Pedons that do not have a Bhs horizon have a Bs or Bs1 horizon that has hue of 7.5YR or 5YR, value of 3 or 4, and chroma of 4. The content of ortstein ranges from 0 to 45 percent.

The BC horizon has hue of 10YR or 7.5YR and value and chroma of 4 to 6.

The C horizon has value of 5 to 7 and chroma of 2 to 6.

Borosaprists

Borosaprists consist of very poorly drained soils on lake plains, outwash plains, and moraines. These soils formed in organic material. Permeability ranges from moderately rapid to moderately slow. Slopes range from 0 to 2 percent.

Reference pedon of Borosaprists, in an area of Borosaprists, euic, 140 feet north and 2,340 feet east of the southwest corner of sec. 21, T. 26 N., R. 1 W.; USGS Luzerne Northwest topographic quadrangle; lat. 44 degrees 40 minutes 6 seconds N. and long. 84 degrees 23 minutes 2 seconds W.; in South Branch Township, Crawford County:

Oe1—0 to 7 inches; mucky peat, dark reddish brown (5YR 3/3) broken face and rubbed; about 75 percent fibers, 25 percent rubbed; weak thick platy structure; very friable; extremely acid; gradual smooth boundary.

Oe2—7 to 13 inches; mucky peat, dark reddish brown (5YR 3/3 and 3/2) broken face and rubbed; about 75 percent fibers, 25 percent rubbed; weak thick platy structure; very friable; extremely acid; gradual smooth boundary.

Oa—13 to 25 inches; muck, dark reddish brown (5YR 2/2) broken face and rubbed; about 25 percent fibers, 10 percent rubbed; massive; friable; extremely acid; abrupt smooth boundary.

Cg—25 to 30 inches; dark grayish brown (10YR 4/2) sand; single grain; very friable; strongly acid; clear smooth boundary.

C—30 to 80 inches; yellowish brown (10YR 5/4) sand; single grain; very friable; strongly acid.

The thickness of the organic materials ranges from 16 to more than 50 inches. The soils may be dysic or euic.

The texture of the surface layer is typically muck or mucky peat. The subsurface layer is dominantly muck. The organic layers have hue of 5YR, 7.5YR, or 10YR, value of 2 to 4, and chroma of 1 to 4. The soils in euic areas are dominantly black or dark reddish brown. Those in dysic areas are typically dark brown.

The mineral layers have hue of 5YR to 5Y, value of 5 or 6, and chroma of 1 to 3. Textures range from sand to sandy clay loam.

Caffey Series

The Caffey series consists of poorly drained soils that formed in sandy outwash over loamy till or lacustrine deposits. These soils are on lake plains and till plains. Permeability is rapid or moderately rapid in the upper part and moderately slow in the lower part. Slopes range from 0 to 2 percent.

Typical pedon of Caffey mucky sand, 2,200 feet south and 300 feet west of the northeast corner of sec. 31, T. 21 N., R. 5 E.; USGS Whittemore topographic quadrangle; lat. 44 degrees 10 minutes 12.92 seconds N. and long. 83 degrees 52 minutes 11.14 seconds W.; in Burleigh Township:

Ap—0 to 8 inches; black (10YR 2/1) mucky sand, dark gray (10YR 4/1) dry; moderate medium granular structure; very friable; very strongly acid; abrupt smooth boundary.

Bw1—8 to 12 inches; brown (10YR 5/3) sand; weak coarse subangular blocky structure; very friable; common medium distinct yellowish brown (10YR 5/6) masses of iron accumulation; strongly acid; clear wavy boundary.

Bw2—12 to 22 inches; yellowish brown (10YR 5/4) sand; weak coarse subangular blocky structure; very friable; common medium distinct yellowish brown (10YR 5/6) masses of iron accumulation; very strongly acid; clear wavy boundary.

Bw3—22 to 37 inches; brown (7.5YR 4/4) sand; weak coarse subangular blocky structure; very friable; common medium prominent strong brown (10YR 4/6) masses of iron accumulation; moderately acid; clear wavy boundary.

2C—37 to 80 inches; grayish brown (2.5Y 5/2) loam; massive; friable; common medium prominent yellowish brown (10YR 5/4) masses of iron accumulation; slightly alkaline.

The depth to the 2C horizon ranges from 20 to 40 inches. The content of gravel ranges from 0 to 15 percent throughout the profile. Some pedons have a thin organic surface layer.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2.

The Bw horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 2 to 4. It is sand, fine sand, loamy sand, or loamy fine sand.

The 2C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4.

Cathro Series

The Cathro series consists of very poorly drained soils that formed in sapric material and in the underlying loamy deposits. These soils are in depressions on outwash plains, lake plains, and moraines. Permeability is moderately slow to moderately rapid in the organic material and moderately slow or moderate in the loamy material. Slopes range from 0 to 2 percent.

Typical pedon of Cathro muck, 2,500 feet north and 75 feet east of the southwest corner of sec. 33, T. 24 N., R. 4 E.; USGS South Branch topographic quadrangle; lat. 44 degrees 25 minutes 42 seconds N. and long. 83 degrees 57 minutes 51 seconds W.; in Goodar Township, Ogemaw County:

Oa1—0 to 5 inches; muck (sapric material), black (10YR 2/1) broken face and rubbed; about 35 percent fibers, 15 percent rubbed; primarily woody material; weak fine granular structure; friable; slightly acid; clear smooth boundary.

Oa2—5 to 19 inches; muck (sapric material), black (5YR 2/1) broken face and rubbed; about 35 percent fibers, 10 percent rubbed; weak fine granular structure; friable; slightly acid; clear wavy boundary.

Oa3—19 to 30 inches; muck (sapric material), black (10YR 2/1) broken face and rubbed; about 30 percent fibers, 10 percent rubbed; weak fine granular structure; friable; neutral; clear wavy boundary.

Cg—30 to 80 inches; dark gray (10YR 4/1) sandy loam; massive; very friable; neutral.

The depth to the C horizon ranges from 16 to 51 inches. The sapric material has hue of 5YR to 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 3.

The surface tier is typically sapric material, but the range includes hemic material. The subsurface and bottom tiers are dominantly sapric material, but layers of hemic material are in some pedons.

The Cg horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 1 to 3. It is sandy loam, sandy clay loam, silty clay loam, or loam.

Colonville Series

The Colonville series consists of somewhat poorly drained soils that formed in loamy and sandy alluvium. These soils are on flood plains. Permeability is moderate. Slopes range from 0 to 2 percent.

Typical pedon of Colonville very fine sandy loam, occasionally flooded, 1,000 feet south and 1,200 feet west of the northeast corner of sec. 12, T. 21 N., R. 5 E.; USGS Whittemore topographic quadrangle; lat. 44 degrees 13 minutes 50.29 seconds N. and long. 83 degrees 46 minutes 4.2 seconds W.; in Burleigh Township:

A1—0 to 6 inches; very dark gray (10YR 3/1) very fine sandy loam, very dark grayish brown (10YR 3/2) dry; weak fine granular structure; friable; common fine to coarse roots; strongly effervescent; slightly alkaline; clear wavy boundary.

A2—6 to 11 inches; very dark grayish brown (10YR 3/2) very fine sandy loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; common fine to coarse roots; common medium prominent strong brown (7.5YR 5/8) masses of iron accumulation; few fine distinct grayish brown (10YR 5/2) iron depletions; strongly effervescent; slightly alkaline; clear wavy boundary.

Bw—11 to 16 inches; brown (10YR 4/3) very fine sandy loam; moderate medium granular structure; friable; many medium and fine roots; few medium distinct gray (10YR 5/1) iron depletions and common coarse distinct dark yellowish brown (10YR 4/6) and many medium faint brown (10YR 5/3) masses of iron accumulation; slightly effervescent; slightly alkaline; clear wavy boundary.

C—16 to 80 inches; pale brown (10YR 6/3), stratified fine sand, silt loam, and very fine sandy loam; weak medium platy structure; very friable; many medium roots; streaks of very dark grayish brown (10YR 3/2) organic material; common medium faint light yellowish brown (10YR 6/4) and common medium distinct dark yellowish brown (10YR 4/6) masses of iron accumulation and common medium distinct dark gray (10YR 4/1) iron depletions; moderately effervescent; slightly alkaline.

The thickness of the mollic epipedon ranges from 11 to 14 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2.

The Bw horizon has value of 4 or 5 and chroma of 3 or 4.

The C horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 or 3. It is stratified very fine sandy loam, sandy loam, fine sandy loam, silt loam, fine sand, and sand.

Coppler Series

The Coppler series consists of well drained soils that formed in sandy outwash. These soils are on stream terraces and in outwash channels. Permeability is moderately rapid in the upper part and very rapid in the lower part. Slopes range from 0 to 12 percent.

Typical pedon of Coppler loamy sand, 0 to 6 percent slopes, 1,190 feet south and 1,980 feet west of the northeast corner of sec. 26, T. 24 N., R. 6 E.; USGS Loud Dam topographic quadrangle; lat. 44 degrees 27 minutes 1.43 seconds N. and long. 83 degrees 40 minutes 23.64 seconds W.; in Oscoda Township:

A—0 to 5 inches; very dark gray (10YR 3/1) loamy sand, gray (10YR 5/1) dry; weak medium granular structure; very friable; many fine and few medium roots; about 5 percent gravel; strongly acid; abrupt smooth boundary.

Bw1—5 to 17 inches; yellowish brown (10YR 5/6) loamy sand; weak medium subangular blocky structure; very friable; many fine and few medium roots; about 5 percent gravel; very strongly acid; clear wavy boundary.

Bw2—17 to 24 inches; yellowish brown (10YR 5/4) gravelly sand; weak medium subangular blocky structure; very friable; common fine and few medium roots; about 25 percent gravel and 10 percent cobbles; strongly acid; abrupt smooth boundary.

2Bt—24 to 29 inches; dark brown (7.5YR 4/4) very gravelly sandy loam; weak medium subangular blocky structure; friable; few fine and medium roots; clay bridges between sand grains; about 30 percent gravel and 10 percent cobbles; neutral; abrupt smooth boundary.

3C—29 to 80 inches; pale brown (10YR 6/3) very gravelly sand; single grain; loose; about 55 percent gravel; violent effervescence; moderately alkaline.

The depth to free carbonates ranges from 25 to 40 inches. The content of gravel ranges from 3 to 10 percent in the A and Bw horizons and from 35 to 55 percent in the 2Bt and 3C horizons. The content of cobbles ranges from 0 to 10 percent throughout the profile.

The A horizon has hue of 7.5YR or 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. The content of gravel ranges from 3 to 10 percent.

Some pedons have an E horizon, which has hue of 10YR, value of 4 to 6, and chroma of 2 or 3. This horizon is sand. The content of gravel ranges from 3 to 10 percent.

The Bw horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 4 to 8. It is loamy sand or sand. Where hue is 7.5YR, values of 4 or 5 do not occur with chroma of 4. The content of gravel ranges from 3 to 10 percent.

The 2Bt horizon has hue of 7.5YR or 10YR and value and chroma of 4 to 6. It is very gravelly sandy loam, very gravelly sandy clay loam, or very gravelly loam. The content of clay ranges from 10 to 25 percent. The content of gravel ranges from 35 to 55 percent.

The 3C horizon has value of 5 or 6 and chroma of 3 or 4. It is stratified very gravelly sand, gravelly sand, coarse sand, gravelly coarse sand, and sand. The content of gravel ranges from 35 to 55 percent.

Corsair Series

The Corsair series consists of somewhat poorly drained soils that formed in stratified sandy and silty deposits. These soils are on lake plains. Permeability is moderately slow. Slopes range from 0 to 3 percent.

Typical pedon of Corsair very fine sandy loam, 0 to 3 percent slopes, 100 feet south and 1,320 feet east of the northwest corner of sec. 15, T. 22 N., R. 7 E.; USGS Tawas City topographic quadrangle; lat. 44 degrees 18 minutes 30.52 seconds N. and long. 83 degrees 34 minutes 40.11 seconds W.; in Tawas Township:

Ap—0 to 8 inches; very dark gray (10YR 3/2) very fine sandy loam, grayish brown (10YR 5/2) dry; weak fine and medium granular structure; friable; common very fine to medium roots; neutral; abrupt smooth boundary.

E/B—8 to 10 inches; about 70 percent pale brown (10YR 6/3) fine sand (E), very pale brown (10YR 7/3) dry; surrounding peds of yellowish brown (10YR 5/4) loamy fine sand (Bt); moderate medium subangular blocky structure; friable; common faint yellowish brown (10YR 5/4) clay bridges; neutral; clear broken boundary.

Bt—10 to 15 inches; dark yellowish brown (10YR 4/4) fine sandy loam; moderate medium subangular blocky structure; friable; common faint dark yellowish brown (10YR 4/4) clay bridges; neutral; clear wavy boundary.

C—15 to 80 inches; yellowish brown (10YR 5/4), stratified very fine sand, sand, and silt; weak thick platy structure; very friable; common medium distinct light brownish gray (10YR 6/2) iron depletions and yellowish brown (10YR 5/8) masses of iron accumulation; moderately alkaline.

The depth to carbonates ranges from 11 to 30 inches.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. It is very fine sandy loam, fine sandy loam, or loamy fine sand.

The E part of the E/B horizon is fine sand or loamy fine sand. The Bt part has hue of 5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. It is loamy fine sand.

The Bt horizon has hue of 5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. It is fine sandy loam or silt loam. The content of clay ranges from 10 to 18 percent.

The C horizon has hue of 5YR to 10YR, value of 5 or 6, and chroma of 3 or 4. It is stratified fine sand, silt, and very fine sandy loam.

Croswell Series

The Croswell series consists of moderately well drained soils that formed in sandy deposits. These soils are on outwash plains, lake plains, lake terraces, and ground moraines. Permeability is rapid. Slopes range from 0 to 6 percent.

Typical pedon of Croswell sand, 0 to 6 percent slopes, 30 feet south and 1,600 feet east of the northwest corner of sec. 27, T. 21 N., R. 5 E.; USGS Whittemore topographic quadrangle; lat. 44 degrees 11 minutes 25.64 seconds N. and long. 83 degrees 49 minutes 2.94 seconds W.; in Burleigh Township:

A—0 to 4 inches; very dark gray (10YR 3/1) sand, gray (10YR 5/1) dry; weak fine granular structure; very friable; many fine to coarse roots; extremely acid; clear wavy boundary.

E—4 to 7 inches; light gray (10YR 7/2) sand, white (10YR 8/1) dry; single grain; loose; many fine to coarse roots; extremely acid; clear wavy boundary.

Bs1—7 to 11 inches; dark brown (7.5YR 4/4) sand; weak medium subangular blocky structure; very friable; common fine and medium roots; columns of dark brown (7.5YR 3/2), weakly cemented ortstein 2 to 5 inches wide and 5 to 10 inches apart; ortstein occupies 45 percent of the horizon; extremely acid; clear wavy boundary.

Bs2—11 to 26 inches; yellowish brown (10YR 5/6) sand; single grain; loose; few fine and medium roots; extremely acid; clear wavy boundary.

BC—26 to 36 inches; brownish yellow (10YR 6/6) sand; single grain; loose; extremely acid; clear wavy boundary.

C1—36 to 60 inches; brownish yellow (10YR 6/6) sand; single grain; loose; common coarse distinct yellowish brown (10YR 5/8) masses of iron accumulation; extremely acid; clear wavy boundary.

C2—60 to 80 inches; pale brown (10YR 6/3) sand; single grain; loose; very strongly acid.

The depth to redoximorphic features ranges from 20 to 40 inches. The content of gravel ranges from 0 to 5 percent throughout the profile.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2.

The E horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 1 or 2.

The Bs1 horizon has hue of 7.5YR or 5YR, value of 3 or 4, and chroma of 4.

The Bs2 horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 8.

The BC horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 4 to 6.

The C horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 2 to 6.

Crowell Series

The Crowell series consists of somewhat excessively drained soils that formed in sandy eolian deposits. These soils are on sand dunes, lake benches, and outwash plains. Permeability is rapid. Slopes range from 8 to 25 percent.

Typical pedon of Crowell sand, in an area of Crowell-Proper complex, 4 to 25 percent slopes, 150 feet north and 1,800 feet west of the southeast corner of sec. 18, T. 21 N., R. 7 E.; USGS National City topographic quadrangle; lat. 44 degrees 12 minutes 23.66 seconds N. and long. 83 degrees 37 minutes 43.49 seconds W.; in Alabaster Township:

A—0 to 4 inches; black (10YR 2/1) sand, gray (10YR 5/1) dry; weak fine granular structure; very friable; extremely acid; abrupt smooth boundary.

E—4 to 8 inches; light brownish gray (10YR 6/2) sand, light gray (10YR 7/2) dry; weak fine granular structure; very friable; extremely acid; clear wavy boundary.

Bs1—8 to 12 inches; dark brown (7.5YR 3/4) sand; weak fine granular structure; very friable; tongues of material from the E horizon extend into this horizon; extremely acid; clear wavy boundary.

Bs2—12 to 17 inches; dark brown (7.5YR 4/4) sand; weak fine granular structure; very friable; extremely acid; clear irregular boundary.

Bs3—17 to 22 inches; yellowish brown (10YR 5/6) sand; single grain; loose; few fine and medium roots between columns of ortstein; columns of strongly cemented, dark reddish brown (5YR 3/4), strong brown (7.5YR 4/6), and brownish yellow (10YR 6/6) ortstein 3 to 10 inches wide extend

into the Bs4 horizon; ortstein columns are 3 to 10 inches apart and occupy 52 percent of the horizon; strongly acid; clear irregular boundary.

Bs4—22 to 34 inches; strong brown (7.5YR 5/8) sand; single grain; loose; columns of strongly cemented, dark reddish brown (5YR 3/4), strong brown (7.5YR 4/6), and brownish yellow (10YR 6/6) ortstein 3 to 10 inches wide extend into this horizon from the Bs3 horizon; ortstein columns are 3 to 10 inches apart and occupy 76 percent of the horizon; strongly acid; clear wavy boundary.

BC—34 to 52 inches; brownish yellow (10YR 6/6) sand; single grain; loose; very strongly acid; clear wavy boundary.

C—52 to 80 inches; very pale brown (10YR 7/4) sand; single grain; loose; strongly acid.

The content of coarse fragments ranges from 0 to 5 percent throughout.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 to 4 and chroma of 0 or 1.

The E horizon has hue of 10YR or 7.5YR, value of 6 or 7, and chroma of 1 or 2.

The Bs1 and Bs2 horizons have hue of 7.5YR or 5YR and value of 3 or 4. The Bs3 and Bs4 horizons have hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 4 to 8. The content of ortstein ranges from 50 to 85 percent.

The BC horizon has value of 5 or 6 and chroma of 4 to 6.

The C horizon has value of 6 or 7 and chroma of 4 or 5.

Cublake Series

The Cublake series consists of moderately well drained soils that formed in sandy outwash over stratified loamy and sandy deposits. These soils are on outwash plains and lake plains. Permeability is rapid in the upper part and moderately slow in the lower part. Slopes range from 0 to 6 percent.

Typical pedon of Cublake sand, 0 to 6 percent slopes, 2,240 feet north and 100 feet east of the southwest corner of sec. 7, T. 24 N., R. 9 E.; USGS Foote Site Village topographic quadrangle; lat. 44 degrees 29 minutes 19.35 seconds N. and long. 83 degrees 23 minutes 58.14 seconds W.; in Oscoda Township:

A—0 to 3 inches; black (N 2/0) sand, very dark gray (10YR 3/1) dry; weak fine granular structure; very friable; many fine and very fine and few medium and coarse roots; extremely acid; abrupt smooth boundary.

E—3 to 5 inches; brown (7.5YR 5/2) sand, pinkish gray (7.5YR 6/2) dry; weak fine granular structure; very friable; common fine and very fine and few medium and coarse roots; very strongly acid; abrupt smooth boundary.

Bs—5 to 10 inches; dark brown (7.5YR 4/3) sand; weak fine and medium subangular blocky structure; very friable; common fine and very fine and few medium and coarse roots; very strongly acid; clear wavy boundary.

Bw1—10 to 13 inches; dark yellowish brown (10YR 4/6) sand; weak fine and medium subangular blocky structure; very friable; common fine and very fine and few medium and coarse roots; very strongly acid; clear wavy boundary.

Bw2—13 to 24 inches; brownish yellow (10YR 6/6) sand; single grain; loose; common fine and very fine and few medium and coarse roots; extremely acid; clear wavy boundary.

C1—24 to 31 inches; pale brown (10YR 6/3) sand; single grain; loose; few fine roots; common medium distinct dark yellowish brown (10YR 4/6) masses of iron accumulation; extremely acid; clear wavy boundary.

C2—31 to 45 inches; very pale brown (10YR 7/4) sand; single grain; loose; common fine and medium prominent yellowish red (5YR 4/6) masses of iron accumulation; very strongly acid; abrupt smooth boundary.

2C3—45 to 80 inches; brown (10YR 5/3), stratified very fine sandy loam and silt loam; weak thick platy structure parting to moderate fine angular blocky; friable; common coarse faint light brownish gray (10YR 6/2) iron depletions and common medium prominent yellowish brown (10YR 5/8) and common medium distinct dark yellowish brown (10YR 4/6) masses of iron accumulation; moderately acid.

The content of gravel ranges from 0 to 5 percent throughout. The depth to redox concentrations ranges from 24 to 40 inches.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 to 4 and chroma of 0 or 1.

The E horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 1 to 3.

The Bs horizon has value and chroma of 3 or 4.

The Bw horizon has hue of 10YR or 7.5YR and value and chroma of 4 to 6.

The C horizon has hue of 10YR or 7.5YR, value of 4 to 7, and chroma of 3 to 6.

The 2C horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 or 4.

Curtisville Series

The Curtisville series consists of deep, well drained soils that formed in moderately fine textured glacial till. These soils are on moraines and till plains. Permeability is slow. Slopes range from 12 to 25 percent.

Typical pedon of Curtisville sandy loam, 18 to 25 percent slopes, 250 feet north and 2,400 feet east of the southwest corner of sec. 19, T. 22 N., R. 5 E.; USGS Hale SE topographic quadrangle; lat. 44 degrees 16 minutes 39.31 seconds N. and long. 83 degrees 52 minutes 27 seconds W.; in Reno Township:

A—0 to 5 inches; very dark grayish brown (10YR 3/2) sandy loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; few fine roots; about 5 percent gravel; strongly acid; clear smooth boundary.

E/B—5 to 10 inches; about 80 percent light brownish gray (10YR 6/2) sandy loam (E), pale brown (10YR 6/3) dry; tonguing into or completely surrounding peds of dark yellowish brown (10YR 4/4) sandy loam (Bt); moderate medium subangular blocky structure; friable; common dark brown (10YR 4/3) worm channels and wormcasts; about 5 percent gravel; strongly acid; clear smooth boundary.

B/E—10 to 16 inches; about 60 percent brown (7.5YR 4/4) clay loam (Bt); surrounding brown (10YR 5/3) sandy loam (E), brown (10YR 5/3) dry; moderate medium subangular blocky structure; firm; common dark brown (10YR 4/3) worm channels and wormcasts; about 5 percent gravel; very strongly acid; clear wavy boundary.

Bt—16 to 29 inches; reddish brown (5YR 4/4) clay; strong medium angular blocky structure; firm; common faint brown (7.5YR 4/4) clay films on faces of peds; about 5 percent gravel; neutral; clear wavy boundary.

BC—29 to 47 inches; reddish brown (5YR 4/4) clay loam; moderate medium angular blocky structure; firm; few distinct brown (7.5YR 4/4) clay films on faces of peds; about 5 percent gravel; slightly alkaline; abrupt wavy boundary.

C—47 to 80 inches; brown (7.5YR 5/4) clay loam; massive; friable; about 5 percent gravel; strongly effervescent; slightly alkaline.

The depth to free calcium carbonates ranges from 20 to 50 inches. Reaction ranges from neutral to very strongly acid in the solum and from slightly alkaline to strongly alkaline in the substratum. The content of gravel ranges from 5 to 15 percent throughout the profile.

The A horizon has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 1 or 2. It is sandy loam, fine sandy loam, or loam.

The E part of the E/B and B/E horizons has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2 or 3. It is sandy loam or fine sandy loam. Some pedons have a separate E horizon, which has colors and textures similar to those of the E part of the E/B and B/E horizons.

The Bt part of the E/B horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 or 4.

The Bt part of the B/E horizon and the underlying Bt horizon have hue of 5YR to 10YR, value of 4 to 6, and chroma of 3 or 4. The texture is clay, clay loam, or silty clay loam. The content of clay ranges from 35 to 45 percent. The content of sand coarser than very fine sand is 15 to 45 percent.

The C horizon has hue of 5YR, 7.5YR, or 10YR and value and chroma of 3 to 6. It is clay loam, clay, or silty clay loam.

Dawson Series

The Dawson series consists of very poorly drained soils that formed in sapric material 16 to 51 inches thick overlying sandy outwash deposits. These soils are in depressions on outwash plains, lake plains, and moraines. Permeability is moderately slow to moderately rapid in the organic material and rapid in the sandy material. Slopes range from 0 to 2 percent.

Typical pedon of Dawson peat, 1,320 feet north and 1,780 feet west of the southeast corner of sec. 33, T. 22 N., R. 5 E.; USGS Hale SE topographic quadrangle; lat. 44 degrees 15 minutes 9.16 seconds N. and long. 83 degrees 49 minutes 47.34 seconds W.; in Reno Township:

Oi—0 to 3 inches; peat (fibric material), dark brown (7.5YR 3/2) broken face, dark brown (7.5YR 3/2) rubbed; about 95 percent fiber, 90 percent rubbed; primarily sphagnum moss fibers; extremely acid; clear wavy boundary.

Oa1—3 to 18 inches; muck (sapric material), black (5YR 2/1) broken face, black (5YR 2/1) rubbed; about 10 percent fiber, 2 percent rubbed; weak fine and medium subangular blocky structure; friable; extremely acid; clear wavy boundary.

Oa2—18 to 27 inches; muck (sapric material), very dark gray (5YR 3/1) broken face, very dark gray (5YR 3/1) rubbed; about 5 percent fiber, 2 percent rubbed; weak thin platy structure; friable; extremely acid; clear wavy boundary.

C1—27 to 35 inches; dark brown (10YR 4/3) sand;

single grain; loose; extremely acid; gradual wavy boundary.

C2—35 to 45 inches; dark brown (7.5YR 3/2) sand; single grain; loose; extremely acid; gradual wavy boundary.

C3—45 to 80 inches; dark yellowish brown (10YR 4/6) sand; single grain; loose; extremely acid.

The depth to the C horizon ranges from 16 to 51 inches. The surface tier is dominantly fibric material.

The sapric material has hue of 10YR to 5YR or is neutral in hue. It has value of 2 or 3 chroma of 0 to 2. The subsurface and bottom tiers are dominantly sapric material, but they may have thin layers of hemic material. The total thickness of the hemic layers is less than 10 inches.

The C horizon has hue of 10YR or 7.5YR, value of 3 to 6, and chroma of 2 to 6. It is sand or fine sand.

Deer Park Series

The Deer Park series consists of excessively drained soils that formed in sandy outwash and eolian deposits. These soils are on beach ridges and dunes. Permeability is rapid. Slopes range from 4 to 18 percent.

Typical pedon of Deer Park sand, in an area of Wurtsmith-Meehan-Deer Park sands, 0 to 18 percent slopes, 1,800 feet south and 1,200 feet east of the northwest corner of sec. 26, T. 22 N., R. 8 E.; USGS East Tawas topographic quadrangle; lat. 44 degrees 16 minutes 26.16 seconds N. and long. 83 degrees 26 minutes 11.84 seconds W.; in Baldwin Township:

Oa—0 to 1 inch; black (10YR 2/1), well decomposed leaf litter; weak thin platy structure; very friable; common medium and coarse and many fine roots; extremely acid; clear smooth boundary.

E—1 to 6 inches; gray (10YR 5/1) sand, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; common medium and coarse and many fine roots; extremely acid; clear wavy boundary.

Bs—6 to 10 inches; dark yellowish brown (10YR 4/6) sand; weak medium subangular blocky structure; very friable; common medium and coarse and many fine roots; extremely acid; clear wavy boundary.

BC1—10 to 13 inches; yellowish brown (10YR 5/6) sand; many medium faint brownish yellow (10YR 6/6) mottles, not resulting from water; weak coarse subangular blocky structure; very friable; common medium and coarse and many fine roots; extremely acid; clear wavy boundary.

BC2—13 to 18 inches; light yellowish brown (10YR 6/4) sand; many medium distinct brownish yellow (10YR 6/6) mottles, not resulting from water; weak coarse subangular blocky structure; very friable; few medium and fine roots; extremely acid; clear wavy boundary.

C—18 to 80 inches; pale brown (10YR 6/3) sand; single grain; loose; extremely acid.

The texture throughout the profile is sand or fine sand.

Some pedons have an A horizon. This horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2.

The E horizon has value of 5 or 6 and chroma of 1 or 2.

The Bs horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6.

The BC horizon has value of 5 or 6 and chroma of 4 to 6. The mottling is the result of deposition and the source of the sand.

The C horizon has chroma of 3 or 4.

Deford Series

The Deford series consists of very poorly drained soils that formed in sandy outwash and lacustrine deposits. These soils are on lake plains, outwash plains, moraines, and deltas. Permeability is rapid. Slopes range from 0 to 2 percent.

Typical pedon of Deford muck, 1,800 feet south and 1,950 feet east of the northwest corner of sec. 7, T. 21 N., R. 6 E.; USGS Whittemore topographic quadrangle; lat. 44 degrees 13 minutes 40.39 seconds N. and long. 83 degrees 45 minutes 25.54 seconds W.; in Grant Township:

Oa—0 to 5 inches; black (5YR 2/1) muck; weak fine granular structure; very friable; common fine to coarse roots; extremely acid; abrupt wavy boundary.

Cg—5 to 21 inches; light brownish gray (10YR 6/2) sand; single grain; loose; common medium and coarse prominent strong brown (7.5YR 5/6) masses of iron accumulation and rhizospheres and common fine and medium light gray (10YR 7/2) iron depletions; 5 percent coarse fragments; few fine roots; very strongly acid; abrupt smooth boundary.

C—21 to 28 inches; pale brown (10YR 6/3) fine sand; single grain; loose; very strongly acid; abrupt smooth boundary.

C′g1—28 to 42 inches; grayish brown (10YR 5/2) fine sand; single grain; loose; streaks of dark grayish brown (2.5Y 4/2) fine sand; very strongly acid; abrupt smooth boundary.

C´g2—42 to 80 inches; grayish brown (2.5Y 5/2) sand; single grain; loose; 5 percent gravel; strongly acid.

The depth to free carbonates ranges from 25 to more than 60 inches.

The Oa horizon has hue of 5YR or 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. The muck is less than 7 inches thick.

The C, Cg, and C´g horizons have hue of 10YR, 2.5Y, or 5Y, value of 5 to 7, and chroma of 1 to 3. They are sand or fine sand.

Dorval Series

The Dorval series consists of very poorly drained soils that formed in sapric material and in the underlying clayey lacustrine deposits. These soils are on lake plains. Permeability is moderately rapid or moderate in the organic layers and very slow in the clayey material. Slopes range from 0 to 2 percent.

Typical pedon of Dorval muck, 2,500 feet north and 650 feet east of the southwest corner of sec. 20, T. 23 N., R. 5 E.; USGS Hale SE topographic quadrangle; lat. 44 degrees 22 minutes 12 seconds N. and long. 83 degrees 51 minutes 46 seconds W.; in Plainfield Township:

Oa1—0 to 5 inches; muck (sapric material), very dark gray (10YR 3/1) broken face and rubbed; about 30 percent fibers, 10 percent rubbed; weak fine granular structure; very friable; slightly acid; clear smooth boundary.

Oa2—5 to 13 inches; muck (sapric material), black (10YR 2/1) broken face, very dark gray (10YR 3/1) rubbed; about 25 percent fibers, 10 percent rubbed; moderate medium subangular blocky structure; friable; neutral; clear smooth boundary.

Oa3—13 to 18 inches; muck (sapric material), black (N 2/0) broken face, black (10YR 2/1) rubbed; about 25 percent fibers, 5 percent rubbed; moderate thin platy structure parting to moderate fine subangular blocky; friable; neutral; abrupt smooth boundary.

Cg1—18 to 20 inches; dark grayish brown (2.5Y 4/2) marl; strong thin platy structure; friable; violently effervescent; slightly alkaline; clear smooth boundary.

Cg2—20 to 30 inches; grayish brown (2.5Y 5/2) silty clay; massive; friable; common fine and medium light olive brown (2.5Y 5/4) masses of iron accumulation and common medium and fine greenish gray (5GY 6/1) iron depletions; violently effervescent; slightly alkaline; gradual wavy boundary.

Cg3—30 to 80 inches; grayish brown (2.5Y 5/2) silty clay; massive; friable; common medium and coarse light olive brown (2.5Y 5/4) masses of iron accumulation and common medium and coarse greenish gray (5GY 6/1) iron depletions; violently effervescent; slightly alkaline.

The depth to the clayey mineral layer ranges from 16 to 45 inches. The organic material is primarily herbaceous.

The organic material has hue of 5YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2.

The Cg horizon has hue of 2.5Y to 7.5YR, value of 4 to 6, and chroma of 1 to 3. It is silty clay or clay.

East Lake Series

The East Lake series consists of somewhat excessively drained soils that formed in sandy and gravelly beach deposits and outwash deposits. These soils are on lake terraces. Permeability is rapid in the upper part and very rapid in the lower part. Slopes range from 0 to 6 percent.

Typical pedon of East Lake sand, 0 to 6 percent slopes, 2,640 feet north and 525 feet east of the southwest corner of sec. 32, T. 25 N., R. 9 E.; USGS Mikado topographic quadrangle; lat. 44 degrees 31 minutes 7 seconds N. and long. 83 degrees 22 minutes 45 seconds W.; in Mikado Township, Alcona County:

A—0 to 4 inches; black (N 2/0) sand, gray (N 5/0) dry; weak medium granular structure; friable; many fine roots; about 3 percent gravel; slightly acid; abrupt smooth boundary.

E—4 to 7 inches; grayish brown (10YR 5/2) sand, light gray (10YR 7/2) dry; weak medium granular structure; very friable; few medium roots; about 3 percent gravel; slightly acid; clear smooth boundary.

Bs1—7 to 12 inches; dark brown (7.5YR 4/4) loamy sand; weak medium subangular blocky structure; very friable; many fine and common medium roots; about 10 percent gravel; about 1 percent cobbles; slightly acid; clear wavy boundary.

Bs2—12 to 20 inches; strong brown (7.5YR 4/6) loamy sand; weak medium subangular blocky structure; very friable; many fine and common medium roots; about 10 percent gravel; about 1 percent cobbles; slightly acid; clear wavy boundary.

Bs3—20 to 30 inches; strong brown (7.5YR 5/6) sand; weak medium subangular blocky structure; very friable; common fine and few medium roots; about 12 percent gravel; about 1 percent cobbles; neutral; abrupt smooth boundary.

2C—30 to 80 inches; brown (10YR 5/3), stratified very gravelly loamy coarse sand and sand; loose; common fine roots in mat at top of horizon; horizon averages about 25 percent gravel; strongly effervescent; moderately alkaline.

The depth to free carbonates ranges from 20 to 40 inches. The content of gravel ranges from 0 to 15 percent in the solum and from 25 to 35 percent in the substratum. The content of cobbles ranges from 0 to 10 percent in the A and E horizons and from 0 to 2 percent throughout the rest of the profile.

The A horizon has hue of 7.5YR or 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2.

The E horizon has value of 5 or 6 and chroma of 1 or 2. It is sand or loamy sand.

The Bs1 horizon has hue of 7.5YR or 5YR and value and chroma of 3 or 4. It is sand or loamy sand.

The Bs2 and Bs3 horizons have hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. They are sand or loamy sand.

The 2C horizon has value of 5 or 6 and chroma of 3 or 4. It is stratified with textures ranging from sand to very gravelly loamy coarse sand.

Endoaquods

The taxonomic classification of these soils is mixed, frigid Endoaquods. The soils are poorly drained and are on lake plains and outwash plains. They formed in sandy lacustrine or outwash material. Permeability is rapid. Slopes range from 0 to 2 percent.

Reference pedon of Endoaquods, wet, nearly level, 800 feet west of the southeast corner of sec. 34, T. 27 N., R. 4 E.; USGS McKinley topographic quadrangle; lat. 44 degrees 40 minutes 55 seconds N. and long. 83 degrees 55 minutes 56 seconds W.; in Oscoda County:

Oi—1 inch to 0; undecomposed hardwood and coniferous leaf litter.

A—0 to 2 inches; black (10YR 2/1) sand, dark grayish brown (10YR 4/2) dry; weak medium subangular blocky structure; very friable; few medium and coarse and many very fine and fine roots; strongly acid; abrupt irregular boundary.

E—2 to 8 inches; dark grayish brown (10YR 4/2) sand, light brownish gray (10YR 6/2) dry; weak medium subangular blocky structure; very friable; strongly acid; abrupt irregular boundary.

Bs1—8 to 13 inches; dark brown (7.5YR 3/4) sand; weak medium subangular blocky structure; friable; common fine prominent yellowish red (5YR 5/6) masses of iron accumulation; strongly acid; clear smooth boundary.

Bs2—13 to 19 inches; dark yellowish brown (10YR 3/6) sand; moderate coarse subangular blocky structure; very friable; few fine distinct strong brown (7.5YR 5/6) masses of iron accumulation; strongly acid; gradual wavy boundary.

C1—19 to 48 inches; yellowish brown (10YR 5/8) sand; single grain; loose; about 15 percent gravel; neutral; clear wavy boundary.

C2—48 to 80 inches; olive brown (2.5Y 4/4) sand; single grain; loose; about 15 percent gravel; neutral.

An organic layer, 4 to 7 inches thick, is typically at the surface. This layer is dominantly muck or mucky peat. It has hue of 5YR to 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2.

The E horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 1 or 2. It is sand, loamy sand, or fine sand.

The Bs horizon has hue of 5YR to 10YR, value of 2 or 3, and chroma of 4 to 6. It is sand, loamy sand, or fine sandy loam.

The C horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 to 8. It is sand, loamy sand, or fine sand.

Entic Haplorthods

The taxonomic classification of these soils is sandy, mixed, frigid Entic Haplorthods. The soils are excessively drained and are on outwash plains, lake plains, and moraines. They formed in sandy glacial drift. Permeability is rapid. Slopes range from 0 to 50 percent.

Reference pedon of Entic Haplorthods, sandy, in an area of Entic Haplorthods, sandy-Alfic Haplorthods, sandy, complex, rolling, 10 feet south and 500 feet west of the northeast corner of sec. 22, T. 26 N., R. 5 E.; USGS Curran topographic quadrangle; lat. 44 degrees 38 minutes 18 seconds N. and long. 83 degrees 48 minutes 31 seconds W.; in Alcona County:

Oe—0 to 1 inch; partially decomposed hardwood and coniferous leaf litter.

A—1 to 3 inches; black (10YR 2/1) sand, dark gray (10YR 4/1) dry; weak fine granular structure; very friable; many very fine and fine roots; strongly acid; clear wavy boundary.

E—3 to 7 inches; brown (7.5YR 5/3) sand, pinkish gray (7.5YR 6/2) dry; weak fine granular structure; very friable; many very fine, common fine, and few medium roots; strongly acid; clear wavy boundary.

Bs1—7 to 11 inches; dark brown (7.5YR 4/4) sand; weak medium granular structure; very friable; many fine and few medium and coarse roots; strongly acid; clear smooth boundary.

Bs2—11 to 23 inches; strong brown (7.5YR 4/6) sand; weak medium granular structure; very friable; common fine and medium and few coarse roots; strongly acid; clear smooth boundary.

BC—23 to 30 inches; brownish yellow (10YR 6/6) sand; weak fine subangular blocky structure; strongly acid; gradual smooth boundary.

C1—30 to 66 inches; very pale brown (10YR 7/4) sand; single grain; loose; few medium roots; moderately acid; gradual wavy boundary.

C2—66 to 180 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; moderately acid.

The thickness of the solum ranges from 20 to 50 inches. The content of gravel ranges from 0 to 10 percent throughout the solum.

The A horizon has hue of 10YR, value of 2 to 4, and chroma of 1 to 3. It is dominantly sand, but the range includes fine sand and loamy sand.

The E horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 2 to 4. It has textures similar to those of the A horizon.

The Bs horizon has hue of 7.5YR or 5YR, value of 3 to 5, and chroma of 4 to 6. It is sand, loamy sand, or fine sand.

The C horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 4 to 6. It is sand or coarse sand. Bands of loamy sand or sandy loam are below a depth of 40 inches in the banded substratum phase. Bands of sandy clay loam or clay loam are below a depth of 40 inches in the fine-loamy banded substratum phase. Sandy clay loam or clay loam is below a depth of 40 inches in the loamy substratum phase. The gravelly analogs of all of these textures are in some pedons. Mottles occur below a depth of 5 feet in the very deep water table phase.

Eutroboralfs

Eutroboralfs consist of well drained and moderately well drained soils. These soils are on moraines. They formed in loamy and sandy glacial till. Permeability is moderate. Slopes range from 0 to 30 percent.

Reference pedon of Eutroboralfs, 2,640 feet north and 1,240 feet west of the southeast corner of sec. 8, T. 25 N., R. 6 E., in Alcona County:

A—0 to 3 inches; very dark gray (10YR 3/1) sandy loam, gray (10YR 5/1) dry; moderate medium granular structure; friable; common very fine and fine and few medium roots; slightly acid; abrupt irregular boundary.

E/B—3 to 12 inches; about 70 percent brown (7.5YR 5/2) loamy sand (E), light brownish gray (10YR 6/2) dry; occurring as tongues extending into or completely surrounding peds of dark brown (7.5YR 4/4) loamy sand (Bt); weak medium subangular blocky structure; friable; common very fine, fine, and medium roots; slightly acid; clear wavy boundary.

B/E—12 to 29 inches; about 60 percent reddish brown (5YR 4/4) sandy clay loam (Bt); penetrated with tongues of brown (7.5YR 5/4) and light brown (7.5YR 6/4) sandy loam (E); moderate medium subangular blocky structure; friable; common very fine, fine, and medium roots; slightly acid; abrupt wavy boundary.

BC—29 to 43 inches; brown (7.5YR 4/4) loamy sand; weak medium granular structure; friable; few very fine, fine, and medium roots; slightly acid; clear wavy boundary.

C1—43 to 58 inches; reddish brown (5YR 4/4) loamy sand; weak fine granular structure; friable; few very fine, fine, and medium roots; slightly acid; clear wavy boundary.

C2—58 to 84 inches; stratified, reddish brown (5YR 4/4) loamy sand and yellowish brown (10YR 5/6) loam; weak fine subangular blocky structure; friable; few fine and medium roots; slightly alkaline.

The thickness of the solum ranges from 20 to 50 inches. The content of gravel ranges from 0 to 15 percent throughout the profile.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. It is dominantly sandy loam, but the range includes loamy sand.

Some pedons have a Bw horizon. This horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It is sandy loam or loamy sand.

The E part of the B/E horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 or 3. It is sandy loam or loamy sand.

The Bt part of the B/E horizon and the Bt horizon have hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 4. The texture is sandy clay loam, sandy loam, loam, or clay loam.

The C horizon has hue of 5YR, 7.5YR, or 10YR, value of 5 or 6, and chroma of 4 to 6. It is loamy sand, sandy loam, loam, sandy clay loam, or clay loam. It is commonly stratified.

Evart Series

The Evart series consists of poorly drained soils that formed in sandy alluvium. These soils are on flood plains. Permeability is rapid. Slopes range from 0 to 2 percent.

Typical pedon of Evart sand, 1,100 feet north and 130 feet west of the southeast corner of sec. 21, T. 24 N., R. 4 E.; USGS South Branch topographic quadrangle; lat. 44 degrees 27 minutes 14 seconds N. and long. 83 degrees 56 minutes 43 seconds W.; in Logan Township, Ogemaw County:

A1—0 to 10 inches; black (10YR 2/1) sand, very dark gray (10YR 3/1) dry; moderate medium subangular blocky structure parting to moderate medium granular; very friable; many fine and medium and few coarse roots; about 1 percent gravel; neutral; clear wavy boundary.

A2—10 to 14 inches; very dark gray (10YR 3/1) sand, dark gray (10YR 4/1) dry; moderate medium granular structure; very friable; many fine and medium roots; few fine distinct yellowish brown (10YR 5/4) masses of iron accumulation; about 1 percent gravel; slightly effervescent; slightly alkaline; abrupt irregular boundary.

Cg1—14 to 22 inches; grayish brown (2.5Y 5/2) sand; single grain; loose; very dark gray (10YR 3/1) organic stains; few fine and medium roots; about 2 percent gravel; slightly effervescent; moderately alkaline; abrupt wavy boundary.

Cg2—22 to 25 inches; dark grayish brown (10YR 4/2) gravelly sand; single grain; loose; very dark gray (10YR 3/1) organic stains; about 20 percent gravel; slightly effervescent; moderately alkaline; abrupt wavy boundary.

C—25 to 36 inches; brown (10YR 5/3) sand; single grain; loose; few medium distinct yellowish brown (10YR 5/6) masses of iron accumulation; about 2 percent gravel; strongly effervescent; moderately alkaline; clear wavy boundary.

C g—36 to 80 inches; grayish brown (10YR 5/2) sand; single grain; loose; few medium distinct yellowish brown (10YR 5/4) masses of iron accumulation; about 1 percent gravel; violently effervescent; moderately alkaline.

The A horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 or 2. It is dominantly sand, but the range includes loamy sand and sandy loam.

The C, Cg, and C´g horizons have hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 2 or 3. They are sand, loamy sand, or gravelly sand. The content of gravel ranges from 1 to 25 percent.

Finch Series

The Finch series consists of somewhat poorly drained soils that formed in sandy outwash. These soils are on outwash plains and lake plains. They contain ortstein. Permeability is moderate in the ortstein and rapid in the rest of the pedon. Slopes range from 0 to 3 percent.

Typical pedon of Finch sand (fig. 17), in an area of Finch-Deford-Au Gres complex, 0 to 3 percent slopes, 500 feet south and 30 feet east of the northwest corner of sec. 13, T. 23 N., R. 8 E.; USGS Foote Site Village topographic quadrangle; lat. 44 degrees 23 minutes 39.68 seconds N. and long. 83 degrees 25 minutes 17.33 seconds W.; in Wilber Township:

Oa—0 to 3 inches; black (5YR 2/1), well decomposed leaf litter; clear smooth boundary.

E1—3 to 6 inches; gray (10YR 6/1) sand, light brownish gray (10YR 6/2)) dry; weak medium subangular blocky structure; very friable; few fine faint white (10YR 8/1) iron depletions; extremely acid; clear wavy boundary.

E2—6 to 12 inches; light brownish gray (10YR 6/2) sand, light gray (10YR 7/2) dry; weak medium subangular blocky structure; very friable; few fine faint light gray (10YR 7/2) iron depletions; extremely acid; abrupt wavy boundary.

Bhsm1—12 to 13 inches; black (5YR 2/2) sand; massive and strong thick platy structure; very firm; ortstein occupies 100 percent of the horizon; extremely acid; abrupt wavy boundary.

Bhsm2—13 to 21 inches; dark reddish brown (5YR 3/3) and black (5YR 2/1) sand; massive and strong thick platy structure; very firm; ortstein occupies 100 percent of the horizon; extremely acid; clear irregular boundary.

BC—21 to 28 inches; yellowish brown (10YR 5/6) sand; single grain; loose; common medium distinct strong brown (7.5YR 4/6) masses of iron accumulation; extremely acid; gradual wavy boundary.

C1—28 to 36 inches; yellowish brown (10YR 5/4) sand; single grain; loose; common fine distinct strong brown (7.5YR 4/6) masses of iron accumulation; extremely acid; gradual wavy boundary.

C2—36 to 80 inches; brown (10YR 5/3) sand; single grain; loose; extremely acid.

The A horizon, if it occurs, has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 1 or 2. The A and E horizons are sand or loamy sand.

The Bhsm horizon has hue of 5YR or 7.5YR and value and chroma of 2 or 3.

The BC horizon has hue of 5YR to 10YR, value of 3 to 5, and chroma of 4 to 6.

The C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4.

Fluvaquents

Fluvaquents consist of somewhat poorly drained and poorly drained soils that formed in loamy or sandy alluvium. These soils are on flood plains. Permeability ranges from moderate to rapid. Slopes range from 0 to 4 percent.

Typical pedon of Fluvaquents, in an area of Aquepts-Histosols-Fluvaquents complex, nearly level to very steep, 600 feet north and 2,400 feet east of the southwest corner of sec. 20, T. 21 N., R. 5 E.; USGS Whittemore topographic quadrangle; lat. 44 degrees 11 minutes 32 seconds N. and long. 83 degrees 51 minutes 16 seconds W.; in Burleigh Township:

A—0 to 6 inches; very dark gray (10YR 3/1) very fine sandy loam, very dark grayish brown (10YR 3/2) dry; weak fine granular structure; friable; common fine to coarse roots; neutral; clear wavy boundary.

Bw—6 to 21 inches; brown (10YR 4/3) sandy loam; moderate medium granular structure; friable; common fine to coarse roots; few fine distinct grayish brown (10YR 5/2) iron depletions; slightly effervescent; slightly alkaline; clear wavy boundary.

C1—21 to 42 inches; brown (10YR 4/3) sandy loam; moderate medium granular structure; friable; many medium and fine roots; few medium distinct gray (10YR 6/1) iron depletions and common coarse distinct dark yellowish brown (10YR 4/6) masses of iron accumulation; neutral; clear wavy boundary.

C2—42 to 80 inches; pale brown (10YR 6/3), stratified fine sand and very fine sandy loam; weak medium platy structure; very friable; many medium roots; common black (10YR 2/1) organic streaks; common medium faint light yellowish brown (10YR 6/4) and common medium distinct dark yellowish brown (10YR 4/6) masses of iron accumulation and common medium distinct dark gray (10YR 4/1) iron depletions; strongly effervescent; moderately alkaline.

The A horizon has hue of 10YR or 7.5YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. It is very fine sandy loam or muck.

The C horizon has hue of 10YR or 2.5YR, value of 4 to 6, and chroma of 2 or 3. It is very fine sandy loam, sandy loam, or fine sandy loam or is stratified silt loam, fine sand, and very fine sandy loam.

Gladwin Series

The Gladwin series consists of somewhat poorly drained soils that formed in sandy deposits underlain by sand and gravel. These soils are on stream terraces. Permeability is moderately rapid in the upper part and very rapid in the lower part. Slopes range from 0 to 3 percent.

The Gladwin soils in this survey area are taxadjuncts because the Bs horizon in the upper part of the subsoil is thinner than is defined as the range for the series. These soils are classified as loamy-skeletal, mixed Aquic Arenic Eutroboralfs.

Typical pedon of Gladwin loamy sand, 0 to 3 percent slopes, 900 feet north and 2,400 feet east of the southwest corner of sec. 15, T. 24 N., R. 7 E.; USGS Sid Town topographic quadrangle; lat. 44 degrees 28 minutes 11.23 seconds N. and long. 83 degrees 34 minutes 38.05 seconds W.; in Oscoda Township:

A—0 to 2 inches; black (10YR 2/1) loamy sand, dark gray (10YR 4/1) dry; weak medium subangular blocky structure; very friable; about 5 percent gravel; strongly acid; clear wavy boundary.

E—2 to 7 inches; light brownish gray (10YR 6/2) sand, light gray (10YR 7/2) dry; weak medium subangular blocky structure; very friable; about 5 percent gravel; strongly acid; clear broken boundary.

Bs1—7 to 10 inches; dark brown (7.5YR 3/4) sand; weak fine subangular blocky structure; very friable; about 5 percent gravel; moderately acid; clear broken boundary.

Bs2—10 to 16 inches; yellowish brown (10YR 5/6) sand; weak fine subangular blocky structure; very friable; few medium faint dark yellowish brown (10YR 4/6) masses of iron accumulation; about 10 percent gravel; moderately acid; clear wavy boundary.

Bw—16 to 22 inches; light yellowish brown (10YR 6/4) sand; weak fine subangular blocky structure; very friable; few fine faint pale brown (10YR 6/3) and many medium distinct yellowish brown (10YR 5/6) masses of iron accumulation; about 10 percent gravel; slightly acid; gradual wavy boundary.

Bt—22 to 26 inches; dark yellowish brown (10YR 4/4) very gravelly sandy loam; moderate medium subangular blocky structure; friable; few fine distinct light brownish gray (10YR 6/2) iron

depletions; about 40 percent gravel; slightly alkaline; gradual wavy boundary.

2C1—26 to 30 inches; yellowish brown (10YR 5/4) very gravelly sand; single grain; loose; few fine distinct dark yellowish brown (10YR 4/6) masses of iron accumulation; about 50 percent gravel; strongly effervescent; moderately alkaline; clear wavy boundary.

2C2—30 to 80 inches; light brownish gray (10YR 6/2) very gravelly sand; single grain; loose; about 50 percent gravel; strongly effervescent; moderately alkaline.

The depth to carbonates ranges from 20 to 40 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. The E horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 2 or 3. The A and E horizons are sand or loamy sand. The content of gravel ranges from 2 to 10 percent.

The Bs1 horizon has hue of 7.5YR or 5YR and value and chroma of 3 or 4. It is sand or loamy sand. The content of gravel ranges from 2 to 10 percent.

The Bs2 horizon has hue of 10YR to 5YR and value and chroma of 3 or 4. It is sand or loamy sand. The content of gravel ranges from 2 to 10 percent.

The Bw horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. It is sand or loamy sand. The content of gravel ranges from 2 to 10 percent.

The Bt horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 4 to 6. It is sandy loam, very gravelly sandy loam, gravelly sandy loam, or gravelly loamy sand. The content of gravel ranges from 10 to 40 percent.

The C horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 2 to 4. It is gravelly sand, very gravelly sand, sand, or stratified sand and gravel. Individual strata may contain up to 50 percent gravel.

Glennie Series

The Glennie series consists of moderately well drained soils that formed in loamy glacial till. These soils are on ground moraines. Permeability is moderately rapid in the upper part and very slow in the lower part. Slopes range from 0 to 12 percent.

Typical pedon of Glennie loamy sand, 0 to 6 percent slopes, 1,885 feet south and 1,850 feet west of the northeast corner of sec. 13, T. 25 N., R. 6 E.; USGS Glennie topographic quadrangle; lat. 44 degrees 33 minutes 46 seconds N. and long. 83 degrees 39 minutes 8 seconds W.; in Curtis Township, Alcona County:

Oe—0 to 2 inches; partially decomposed forest litter; abrupt smooth boundary.

A—2 to 3 inches; black (10YR 2/1) loamy sand, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; many fine roots; about 5 percent gravel; neutral; abrupt smooth boundary.

E—3 to 7 inches; grayish brown (10YR 5/2) loamy sand, light gray (10YR 7/2) dry; weak medium subangular blocky structure; friable; common fine and medium roots; about 5 percent gravel; slightly acid; abrupt broken boundary.

Bt1—7 to 11 inches; dark brown (7.5YR 3/4) sandy loam; moderate medium subangular blocky structure; friable; many fine roots; few distinct clay coatings on sand grains and clay bridges between sand grains; about 5 percent gravel and 1 percent cobbles; neutral; abrupt broken boundary.

Bt2—11 to 20 inches; strong brown (7.5YR 4/6) loamy sand; weak medium subangular blocky structure; friable; common fine roots; clay coatings on sand grains and clay bridges between sand grains; about 5 percent gravel; neutral; clear wavy boundary.

(E/B)x—20 to 40 inches; about 60 percent brown (10YR 5/3) loamy sand (E), very pale brown (10YR 7/3) dry; surrounding reddish brown (5YR 5/3) loam (Bt); massive; firm; few fine roots; common fine vesicular pores; about 5 percent gravel; brittle; neutral; clear irregular boundary.

(B/E)x—40 to 46 inches; about 70 percent reddish brown (5YR 4/4) sandy clay loam (Bt); surrounding brown (10YR 5/3) sandy loam (E), very pale brown (10YR 7/3) dry; weak thick platy structure; very firm; few fine roots in cracks; common fine vesicular pores; few faint dark reddish brown (5YR 3/4) clay films; few fine prominent strong brown (7.5YR 5/6) masses of iron accumulation; about 5 percent gravel; brittle; slightly acid; clear irregular boundary.

B't1—46 to 56 inches; dark reddish brown (5YR 3/4) sandy clay loam; weak medium prismatic structure parting to moderate medium angular blocky; very firm; common fine roots between peds; many faint dark reddish brown (5YR 3/4) clay films 1 to 4 millimeters thick on vertical faces of peds; few fine prominent strong brown (7.5YR 5/6) masses of iron accumulation; about 5 percent gravel; neutral; clear irregular boundary.

B't2—56 to 85 inches; reddish brown (5YR 4/4) sandy clay loam; weak medium angular blocky structure; very firm; common faint dark reddish brown (5YR 3/4) clay films on faces of peds; about 8 percent gravel; slightly effervescent; slightly alkaline; clear wavy boundary.

Cd—85 to 99 inches; reddish brown (5YR 5/3) sandy clay loam; massive; firm; about 8 percent gravel; strongly effervescent; moderately alkaline.

Depth to the fragipan is about 20 to 40 inches. The content of gravel ranges from 0 to 10 percent throughout the profile, and the content of cobbles ranges from 0 to 7 percent.

The A horizon has hue of 10YR or 7.5YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. Pedons in cultivated areas have an Ap horizon, which is 6 to 9 inches thick. This horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 1 or 2.

The E horizon has hue of 7.5YR or 10YR or is neutral in hue. It has value of 5 or 6 and chroma of 0 to 3.

The Bt horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 4 to 8. It is sandy loam or loamy sand. The content of clay ranges from 5 to 15 percent.

The E part of the (E/B)x and (B/E)x horizons has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 2 to 4. It is loamy sand or sandy loam.

The Bt part of the (E/B)x and (B/E)x horizons has hue of 5YR or 7.5YR, value of 3 to 5, and chroma of 3 to 6. It is loam or sandy clay loam.

The B't horizon has hue of 5YR or 7.5YR, value of 3 to 5, and chroma of 3 or 4. It is clay loam, sandy clay loam, or sandy loam.

The Cd horizon has hue of 5YR or 7.5YR, value of 5 or 6, and chroma of 3 or 4. It is sandy clay loam, clay loam, or loam.

Graycalm Series

The Graycalm series consists of somewhat excessively drained soils that formed in sandy outwash deposits. These soils are on outwash plains, deltas, and stream terraces. Permeability is rapid. Slopes range from 0 to 50 percent.

Typical pedon of Graycalm sand, 0 to 6 percent slopes, 50 feet south and 350 feet east of the northwest corner of sec. 17, T. 22 N., R. 7 E.; USGS Tawas City topographic quadrangle; lat. 44 degrees 18 minutes 29.34 seconds N. and long. 83 degrees 37 minutes 22.95 seconds W.; in Tawas Township:

A—0 to 4 inches; black (10YR 2/1) sand, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; friable; many fine to coarse roots; about 3 percent gravel; extremely acid; clear wavy boundary.

Bw1—4 to 16 inches; strong brown (7.5YR 4/6) sand; weak medium subangular blocky structure; friable; many fine and medium and common coarse roots; about 3 percent gravel; extremely acid; clear wavy boundary.

Bw2—16 to 26 inches; yellowish brown (10YR 5/6) sand; weak fine and medium subangular blocky structure; very friable; many fine and medium and common coarse roots; about 3 percent gravel; extremely acid; clear wavy boundary.

Bw3—26 to 33 inches; brownish yellow (10YR 6/6) sand; weak fine and medium subangular blocky structure; very friable; common fine and medium roots; extremely acid; clear wavy boundary.

Bw4—33 to 45 inches; yellow (10YR 7/6) sand; weak medium subangular blocky structure parting to weak medium granular; very friable; extremely acid; clear wavy boundary.

E&Bt1—45 to 65 inches; very pale brown (10YR 7/4) sand (E), very pale brown (10YR 7/3) dry; single grain; loose; lamellae of strong brown (7.5YR 5/6) loamy sand (Bt); weak very fine subangular blocky structure; very friable; lamellae are $^{1}/_{16}$ to $^{1}/_{4}$ inch thick; few faint strong brown (7.5YR 5/6) clay bridges; extremely acid; clear wavy boundary.

E&Bt2—65 to 80 inches; very pale brown (10YR 7/3) sand (E), white (10YR 8/2) dry; single grain; loose; lamellae of strong brown (7.5YR 5/6) loamy sand (Bt); weak very fine subangular blocky structure; very friable; lamellae are $^{1}/_{16}$ to $^{1}/_{4}$ inch thick; few faint strong brown (7.5YR 5/6) clay bridges; extremely acid.

The content of gravel ranges from 0 to 10 percent throughout.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 3.

The Bw horizon has hue of 10YR or 7.5YR, value of 3 to 7, and chroma of 4 to 6. It is sand or loamy sand.

The E part of the E&Bt horizon has value of 5 to 7 and chroma of 3 to 6. The Bt part has value of 4 or 5. It consists of lamellae $^{1}/_{16}$ to $^{1}/_{4}$ inch thick. The total accumulation within a depth of 80 inches is less than 6 inches.

Grayling Series

The Grayling series consists of excessively drained soils that formed in sandy glacial deposits. These soils are on outwash plains, river terraces, and deltas. Permeability is rapid. Slopes range from 0 to 50 percent.

Typical pedon of Grayling sand, 0 to 6 percent slopes, 1,500 feet north and 2,600 feet east of the southwest corner of sec. 9, T. 24 N., R. 8 E.; USGS Foote Site Village topographic quadrangle; lat. 44 degrees 29 minutes 12.76 seconds N. and long. 83

degrees 28 minutes 20.2719 seconds W.; in Oscoda Township:

A—0 to 3 inches; black (N 2/0) sand, dark gray (10YR 4/1) dry; weak fine granular structure; very friable; many medium and fine and few coarse roots; about 1 percent gravel; extremely acid; abrupt smooth boundary.

Bw1—3 to 14 inches; dark brown (7.5YR 4/4) sand; weak medium subangular blocky structure; very friable; many fine and very fine and common medium and coarse roots; about 1 percent gravel; extremely acid; clear wavy boundary.

Bw2—14 to 20 inches; yellowish brown (10YR 5/8) sand; single grain; loose; many fine and very fine roots; about 1 percent gravel; extremely acid; clear wavy boundary.

BC—20 to 41 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; about 1 percent gravel; extremely acid; clear wavy boundary.

C—41 to 80 inches; very pale brown (10YR 7/3) sand; single grain; loose; about 1 percent gravel; extremely acid.

The content of gravel ranges from 0 to 5 percent throughout.

The A horizon has hue of 10YR or is neutral in hue. It has chroma of 0 or 1.

The Bw horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 8.

The BC and C horizons have value of 5 to 7 and chroma of 3 or 4. They are sand or stratified sand and coarse sand.

Thin lamellae of loamy sand or sandy loam are below a depth of 60 inches in the banded substratum phase. Free carbonates are below a depth of 60 inches in the calcareous substratum phases. A water table is below a depth of 60 inches in the very deep water table phase.

Grousehaven Series

The Grousehaven series consists of very poorly drained soils that formed in organic material over marl. These soils are in bogs on outwash plains, lake plains, and moraines. Permeability is moderately slow to moderately rapid in the organic material and slow or very slow in the marl. Slopes are 0 to 1 percent.

Typical pedon of Grousehaven muck, 100 feet south and 1,200 feet west of the northeast corner of sec. 34, T. 21 N., R. 5 E.; USGS Whittemore topographic quadrangle; lat. 44 degrees 10 minutes 34.97 seconds N. and long. 83 degrees 48 minutes 28.96 seconds W.; in Burleigh Township:

Oa—0 to 12 inches; muck (sapric material), black (N 2/0) broken face and rubbed; 80 percent fibers, 15 percent rubbed; many medium and coarse roots; moderate medium granular structure; very friable; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Cg1—12 to 19 inches; pinkish white (7.5YR 8/2) marl; massive; very friable; few medium and coarse roots; many medium and coarse distinct strong brown (7.5YR 5/6) and common fine and medium prominent dark yellowish brown (10YR 6/4) masses of iron accumulation; violently effervescent; strongly alkaline; abrupt smooth boundary.

Cg2—19 to 48 inches; white (10YR 8/1) marl; massive; very friable; violently effervescent; strongly alkaline; abrupt smooth boundary.

Cg3—48 to 80 inches; gray (10YR 6/1) marl; massive; very friable; violently effervescent; strongly alkaline.

The depth to marl ranges from 8 to 15 inches. The organic material is primarily herbaceous.

The Cg horizon has hue of 10YR or 7.5YR, value of 6 to 8, and chroma of 1 or 2.

Histosols

Histosols consist of very poorly drained soils that formed in sapric material and in the underlying mineral deposits. These soils are on lake plains, outwash plains, till plains, moraines, and flood plains. Permeability ranges from rapid to very slow. Slopes range from 0 to 2 percent.

Reference pedon of Histosols, in an area of Histosols and Aquents, ponded, 2,400 feet south and 50 feet east of the northwest corner of sec. 2, T. 23 N., R. 5 E.; USGS Hale topographic quadrangle; lat. 44 degrees 24 minutes 56.88 seconds N. and long. 83 degrees 48 minutes 19 seconds W.; in Plainfield Township:

Oa1—0 to 10 inches; muck (sapric material), black (N 2/0) broken face and rubbed; about 30 percent fibers, 10 percent rubbed; weak fine granular structure; friable; very strongly acid; abrupt smooth boundary.

Oa2—10 to 51 inches; muck (sapric material), very dark gray (N 3/0) broken face and rubbed; about 25 percent fibers, 10 percent rubbed; massive; friable; very strongly acid; clear wavy boundary.

Cg—51 to 80 inches; gray (10YR 6/1) sandy loam; massive; friable; slightly acid.

The thickness of the organic material ranges from 16 to 80 inches. The organic material is sapric or hemic.

The organic material has hue of 5YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2.

The Cg horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 1 or 2. It is sandy loam, loam, clay loam, silty clay, or clay.

Hottis Series

The Hottis series consists of very deep, well drained, slowly permeable soils that formed in clay till. These soils are on till plains and moraines. Slopes range from 12 to 18 percent.

Typical pedon of Hottis sandy loam, 12 to 18 percent slopes, 2,075 feet south and 1,980 feet east of the northwest corner of sec. 7, T. 21 N., R. 5 E.; USGS Prescott topographic quadrangle; lat. 44 degrees 13 minutes 41.43 seconds N. and long. 83 degrees 52 minutes 30.66 seconds W.; in Burleigh Township:

A—0 to 5 inches; very dark gray (10YR 3/1) sandy loam, light gray (10YR 6/1) dry; moderate medium granular structure; friable; few fine and medium roots; 5 percent gravel; strongly acid; clear smooth boundary.

E/B—5 to 9 inches; about 80 percent brown (10YR 5/3) sandy loam (E), very pale brown (10YR 7/3) dry; tonguing into or completely surrounding peds of dark yellowish brown (10YR 4/4) sandy loam (Bt); moderate medium subangular blocky structure; friable; few fine and medium roots; 5 percent gravel; strongly acid; clear smooth boundary.

B/E—9 to 13 inches; about 70 percent brown (7.5YR 4/4) clay (Bt); penetrated by tongues of brown (10YR 5/3) sandy loam (E), very pale brown (10YR 7/3) dry; strong medium angular blocky structure; firm; few fine and medium roots; 5 percent gravel; strongly acid; clear wavy boundary.

Bt—13 to 33 inches; strong brown (7.5YR 4/6) clay; strong fine and medium angular blocky structure; firm; many distinct brown (7.5YR 4/4) clay films on faces of peds; 5 percent gravel; slightly acid; clear wavy boundary.

BC—33 to 80 inches; brown (7.5YR 5/4) clay; moderate coarse subangular blocky structure; firm; many distinct dark brown (7.5YR 3/4) clay films on faces of peds; common prominent pinkish white (7.5YR 8/2) carbonate coatings on faces of peds; 5 percent gravel; moderately alkaline.

The depth to carbonates ranges from 20 to 35 inches. The content of gravel ranges from 0 to 10 percent throughout the profile, and the content of cobbles ranges from 0 to 2 percent.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 1 or 2. Pedons in cultivated areas have an Ap horizon. The A or Ap horizon is sandy loam, fine sandy loam, or loam.

The E part of the E/B and B/E horizons has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 2 or 3. It is sandy loam or loam.

The B part of the E/B horizon has hue of 10YR or 7.5YR. The B part of the B/E horizon has hue of 5YR or 7.5YR, value of 3 to 5, and chroma of 3 to 6.

The Bt horizon has hue of 5YR or 7.5YR, value of 3 to 5, and chroma of 3 to 6. It is clay or silty clay. The content of clay averages 45 to 60 percent. The content of sand coarser than very fine sand is 15 to 45 percent.

The BC horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 to 6, and chroma of 3 or 4. It is clay, silty clay, or clay loam.

Iargo Series

The Iargo series consists of moderately well drained soils that formed in stratified silty and clayey lacustrine deposits. These soils are on lake plains. Permeability is slow. Slopes range from 2 to 12 percent.

Typical pedon of Iargo silt loam, in an area of Manary-Iargo complex, 0 to 6 percent slopes, 1,580 feet south and 75 feet west of the northeast corner of sec. 21, T. 22 N., R. 6 E.; USGS Floyd Lake topographic quadrangle; lat. 44 degrees 17 minutes 16.18 seconds N. and long. 83 degrees 42 minutes 15.45 seconds W.; in Grant Township:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, pale brown (10YR 6/3) dry; moderate medium subangular blocky structure; friable; neutral; abrupt smooth boundary.

Bt—8 to 12 inches; brown (7.5YR 4/4) silty clay; moderate medium angular blocky structure; firm; many prominent brown (7.5YR 3/4) clay flows on horizontal and vertical faces of peds; slightly alkaline; clear wavy boundary.

BC—12 to 19 inches; strong brown (7.5YR 4/6) silty clay; weak very thick platy structure parting to strong medium and coarse angular blocky; firm; few distinct brown (7.5YR 3/4) clay flows on horizontal and vertical faces of peds; few medium faint strong brown (7.5YR 5/6) masses of iron accumulation; slightly alkaline; clear wavy boundary.

C1—19 to 45 inches; brown (7.5YR 5/4) silty clay loam

with strata of silt loam 1 to 3 inches thick; weak very thick platy structure parting to strong medium and coarse angular blocky; firm; few prominent pinkish white (7.5YR 8/2) and greenish gray (5GY 6/1) carbonate coatings on faces of peds; many medium prominent brownish yellow (10YR 6/6) masses of iron accumulation; strongly effervescent; moderately alkaline; clear wavy boundary.

C2—45 to 80 inches; light olive brown (2.5Y 5/4) and brown (7.5YR 5/4) very fine sand and silt loam with strata of silty clay loam 3 to 5 inches thick; weak very thick platy structure parting to moderate medium and coarse subangular blocky; friable; few prominent pinkish white (7.5YR 8/2) carbonate coatings on faces of peds; common medium prominent brownish yellow (10YR 6/6) masses of iron accumulation and greenish gray (5GY 6/1) iron depletions; strongly effervescent; moderately alkaline.

The depth to free carbonates ranges from 16 to 30 inches. The content of coarse fragments ranges from 0 to 5 percent throughout the profile.

The Ap horizon has value of 2 to 4 and chroma of 1 to 3. It is silt loam, silty clay loam, or fine sandy loam.

The Bt horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 4 to 6. It is silty clay, silty clay loam, clay, or clay loam.

The BC horizon has hue of 7.5YR or 10YR and value and chroma of 4 to 6. Some stratification may occur. Textures include silty clay, silty clay loam, silt loam, and clay.

The C horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 2 to 4. It is very stratified. Textures include very fine sand, fine sand, loamy very fine sand, silt, silt loam, silty clay loam, silty clay, and clay.

Ingalls Series

The Ingalls series consists of somewhat poorly drained soils that formed in sandy outwash overlying stratified lacustrine sediments. These soils are on lake plains and outwash plains. Permeability is rapid in the upper part and moderately slow in the lower part. Slopes range from 0 to 3 percent.

Typical pedon of Ingalls sand, 0 to 3 percent slopes, 150 feet south and 600 feet east of the northwest corner of sec. 12, T. 24 N., R. 8 E.; USGS Foote Site Village topographic quadrangle; lat. 44 degrees 29 minutes 48.44 seconds N. and long. 83 degrees 25 minutes 8.19 seconds W.; in Oscoda Township:

Ap—0 to 9 inches; black (10YR 2/1) sand, gray (10YR 5/1) dry; weak fine granular structure; very friable; strongly acid; clear smooth boundary.

E—9 to 12 inches; light gray (10YR 7/2) sand, white (10YR 8/2) dry; common fine faint white (10YR 8/1) iron depletions; single grain; loose; strongly acid; clear wavy boundary.

Bs—12 to 16 inches; dark brown (7.5YR 4/4) sand; common medium distinct yellowish brown (10YR 5/4) masses of iron accumulation; weak medium subangular blocky structure; very friable; pockets of dark brown (7.5YR 3/4) ortstein; ortstein occupies 10 percent of the horizon; very strongly acid; clear wavy boundary.

BC—16 to 27 inches; pale brown (10YR 6/3) fine sand; common coarse distinct brown (7.5YR 5/4) and many medium faint light brownish gray (10YR 6/2) iron depletions; weak coarse subangular blocky structure; friable; strongly acid; clear wavy boundary.

2C1—27 to 42 inches; stratified pale brown (10YR 6/3), light gray (5Y 7/2), and light reddish brown (5YR 6/3) sand, very fine sand, and silt; common medium faint light yellowish brown (10YR 6/4) masses of iron accumulation; weak medium and thick platy structure; friable; slightly effervescent; slightly alkaline; clear wavy boundary.

2C2—42 to 80 inches; stratified brown (10YR 5/3), strong brown (7.5YR 4/6), and pale brown (10YR 6/3) fine sand, fine sandy loam, silty clay loam, and silt; weak medium and thick platy structure; friable; strongly effervescent; moderately alkaline.

The depth to free carbonates ranges from 18 to more than 60 inches. The content of gravel ranges from 0 to 10 percent throughout the profile.

The Ap horizon has hue of 10YR or is neutral in hue. It has value of 2 to 4 and chroma of 0 to 3.

The E horizon has value of 5 to 7 and chroma of 2 or 3.

The Bs horizon has value of 3 or 4. Some pedons have a Bs2 horizon. This horizon has hue of 7.5YR or 10YR, value of 3 to 6, and chroma of 4 to 6. It is sand.

The BC horizon has value of 4 to 6 and chroma of 3 to 6. It is fine sand or sand.

The 2C horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 1 to 4. It has strata of silt, silt loam, fine sandy loam, very fine sandy loam, sandy loam, loamy fine sand, fine sand, very fine sand, sand, silty clay loam, and loam. The thickness of individual strata ranges from less than 1 inch to 18 inches.

Kanotin Series

The Kanotin series consists of very poorly drained soils that formed in sandy outwash over clayey lacustrine deposits. These soils are on lake plains. Permeability is rapid in the upper part and very slow in the lower part. Slopes range from 0 to 2 percent.

Typical pedon of Kanotin muck, 50 feet north and 1,000 feet east of the southwest corner of sec. 20, T. 21 N., R. 7 E.; USGS Alabaster topographic quadrangle; lat. 44 degrees 11 minutes 31 seconds N. and long. 83 degrees 37 minutes 4 seconds W.; in Alabaster Township:

Oa1—0 to 4 inches; black (N 2/0) muck (sapric material); 50 percent fibers, 10 percent rubbed; weak fine granular structure; very friable; common fine and medium roots; extremely acid; abrupt wavy boundary.

Oa2—4 to 9 inches; black (N 2/0) muck (sapric material); 25 percent fibers, 5 percent rubbed; weak fine granular structure; very friable; common fine and medium roots; extremely acid; abrupt wavy boundary.

E—9 to 12 inches; grayish brown (10YR 5/2) sand, gray (10YR 6/1) dry; single grain; loose; extremely acid; clear wavy boundary.

Bhs—12 to 26 inches; black (5YR 2/1) sand; single grain; loose; extremely acid; clear wavy boundary.

Bs—26 to 46 inches; strong brown (7.5YR 4/6) sand; single grain; loose; common fine roots; extremely acid; clear wavy boundary.

C—46 to 51 inches; brownish yellow (10YR 6/6) sand; single grain; loose; extremely acid; clear wavy boundary.

2Ab—51 to 58 inches; dark brown (10YR 4/3), stratified very fine sand and silt loam; few fine faint very dark grayish brown (10YR 3/2) iron depletions; massive; friable; extremely acid; clear wavy boundary.

3C—58 to 80 inches; gray (5Y 5/1) silty clay; massive; very firm; strongly effervescent; moderately alkaline.

The depth to clayey material ranges from 40 to 60 inches. The content of gravel ranges from 0 to 5 percent throughout the profile.

The Oa horizon has hue of 5YR or is neutral in hue.

The E horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 1 or 2.

The Bhs horizon has hue of 5YR or 7.5YR, value of 2 or 3, and chroma of 1 or 2.

The Bs horizon has hue of 7.5YR or 10YR, value of 3 to 6, and chroma of 4 to 6. It contains 0 to 50 percent ortstein.

The C horizon has value of 5 or 6 and chroma of 4 to 6.

The 2Ab horizon is very fine sand or silt loam or is stratified.

The 3C horizon has value of 4 or 5 and chroma of 1 or 2.

Kawkawlin Series

The Kawkawlin series consists of somewhat poorly drained soils that formed in loamy till. These soils are on till plains and moraines. Permeability is slow. Slopes range from 0 to 4 percent.

Typical pedon of Kawkawlin loam, 1 to 4 percent slopes, 1,800 feet south and 2,600 feet east of the northwest corner of sec. 20, T. 22 N., R. 5 E.; USGS Hale SE topographic quadrangle; lat. 44 degrees 17 minutes 13.25 seconds N. and long. 83 degrees 51 minutes 12.89 seconds W.; in Reno Township:

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) loam, pale brown (10YR 6/3) dry; moderate medium subangular blocky structure; friable; many fine and medium roots; about 5 percent gravel; strongly acid; abrupt smooth boundary.

E/B—10 to 15 inches; about 60 percent grayish brown (10YR 5/2) fine sandy loam (E), light gray (10YR 7/2) dry; surrounding peds of dark brown (7.5YR 4/4) clay loam (Bt); moderate medium subangular blocky structure; friable; common distinct dark yellowish brown (10YR 4/4) clay flows on horizontal faces of peds; common fine and medium roots; common medium prominent strong brown (7.5YR 5/6) masses of iron accumulation; about 10 percent gravel; moderately acid; clear wavy boundary.

Bt—15 to 29 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure; friable; few fine roots; common distinct brown (10YR 5/3) clay films on faces of peds; common medium prominent strong brown (7.5YR 4/6) masses of iron accumulation and common medium prominent grayish brown (2.5YR 5/2) iron depletions; about 10 percent gravel; slightly acid; gradual wavy boundary.

C1—29 to 44 inches; reddish brown (10YR 5/4) clay loam; massive; friable; common patchy prominent light gray (10YR 7/2) calcium carbonate coatings on faces of fracture planes; common medium distinct yellowish brown (10YR 5/8) and brown (7.5YR 5/4) masses of iron accumulation and common medium prominent greenish gray (5GY 6/1) iron depletions; about 10 percent gravel;

strongly effervescent; moderately alkaline; gradual wavy boundary.

C2—44 to 80 inches; brown (7.5YR 5/4) clay loam; massive; friable; many patchy prominent light gray (10YR 7/2) calcium carbonate coatings on faces of fracture planes; about 10 percent gravel; violently effervescent; moderately alkaline.

The content of gravel ranges from 1 to 10 percent throughout.

The Ap horizon has chroma of 1 or 2. It is loam, sandy loam, or fine sandy loam.

The E part of the E/B horizon has hue of 7.5YR or 10YR and value of 5 or 6. It is fine sandy loam or sandy loam. The Bt part has hue of 10YR to 5YR, value of 4 or 5, and chroma of 3 or 4. It is loam, sandy loam, or clay loam.

The Bt horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 3 or 4. It is loam, sandy loam, clay loam, silty clay loam, or clay. The content of clay ranges from 35 to 45 percent.

The C horizon has hue of 5YR to 10YR and value of 5 or 6. It is clay loam or silty clay loam.

Kent Series

The Kent series consists of moderately well drained soils that formed in clayey till deposits. These soils are on till plains and moraines. Permeability is slow. Slopes range from 2 to 12 percent.

Typical pedon of Kent sandy loam, 2 to 6 percent slopes, 2,400 feet south and 900 feet east of the northwest corner of sec. 7, T. 21 N., R. 5 E.; USGS Prescott topographic quadrangle; lat. 44 degrees 13 minutes 36.41 seconds N. and long. 83 degrees 52 minutes 50.39 seconds W.; in Burleigh Township:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) sandy loam, light brownish gray (10YR 6/2) dry; moderate fine and medium subangular blocky structure; friable; many fine roots; 2 percent gravel; neutral; abrupt smooth boundary.

B/E—8 to 14 inches; about 75 percent dark brown (7.5YR 4/4) clay (Bt); surrounded by grayish brown (10YR 5/2) loam (E), light gray (10YR 7/2) dry; strong medium and coarse subangular blocky structure; firm; many fine roots; 2 percent gravel; neutral; clear wavy boundary.

Bt—14 to 26 inches; reddish brown (5YR 4/4) clay; strong coarse prismatic structure parting to strong medium and coarse angular blocky and moderate fine and medium subangular blocky; firm; many fine roots; many reddish brown (5YR 4/3) clay films on faces of peds; few distinct black (10YR 2/1) organic coatings on faces of peds; 2 percent gravel; slightly acid; abrupt smooth boundary.

BC—26 to 40 inches; dark brown (7.5YR 4/4) clay; weak medium subangular blocky structure; firm; common distinct pinkish gray (7.5YR 7/2) carbonate coatings on faces of peds; few fine distinct reddish yellow (7.5YR 6/6) masses of iron accumulation; 2 percent gravel; strongly effervescent; moderately alkaline; clear wavy boundary.

C1—40 to 55 inches; brown (7.5YR 5/4) clay; massive; very firm; few reddish brown (5YR 4/3) clay films; few light gray (10YR 7/2) carbonate coatings on faces of peds; few fine distinct reddish yellow (7.5YR 6/8) masses of iron accumulation; 2 percent gravel; violently effervescent; moderately alkaline; clear wavy boundary.

C2—55 to 80 inches; brown (7.5YR 5/4) clay; massive; very firm; many light gray (10YR 7/2) carbonate coatings on faces of peds; 2 percent gravel; violently effervescent; moderately alkaline.

The depth to carbonates ranges from 17 to 30 inches.

The E part of the B/E horizon has value of 5 to 7 and chroma of 2 or 3. It is fine sandy loam, sandy loam, or loam.

The Bt part of the B/E horizon and the Bt horizon have hue of 5YR or 7.5YR and value and chroma of 3 or 4. The texture is clay or silty clay. The content of clay ranges from 45 to 60 percent. The content of sand coarser than fine sand ranges from 15 to 30 percent.

The C horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 3 or 4. It is clay or silty clay.

Klacking Series

The Klacking series consists of well drained soils that formed in sandy till and outwash. These soils are on moraines and outwash plains. Permeability is moderately rapid. Slopes range from 6 to 18 percent.

Typical pedon of Klacking sand, 6 to 18 percent slopes, 2,400 feet north and 1,500 feet east of the southwest corner of sec. 7, T. 24 N., R. 4 E.; USGS Rose City topographic quadrangle; lat. 44 degrees 29 minutes 8 seconds N. and long. 84 degrees 0 minutes 4 seconds W.; in Goodar Township, Ogemaw County:

A—0 to 2 inches; black (10YR 2/1) sand, dark grayish brown (10YR 4/2) dry; weak fine granular structure; very friable; many fine and common medium roots; strongly acid; abrupt smooth boundary.

Bw1—2 to 12 inches; yellowish brown (10YR 5/8) sand; weak fine granular structure; friable; many fine and medium and common coarse roots; about 7 percent gravel; strongly acid; clear wavy boundary.

Bw2—12 to 24 inches; dark yellowish brown (10YR 4/6) sand; weak fine granular structure; friable; many fine and common medium roots; about 9 percent gravel; slightly acid; clear wavy boundary.

Bw3—24 to 34 inches; yellowish brown (10YR 5/6) sand; weak fine granular structure; friable; common medium and few fine roots; about 11 percent gravel; slightly acid; clear irregular boundary.

E&Bt—34 to 44 inches; yellowish brown (10YR 5/4) sand (E) and strong brown (7.5YR 4/6) loamy sand (Bt); weak fine subangular blocky structure; friable; few fine and medium roots; about 9 percent gravel; slightly acid; abrupt irregular boundary.

B/E—44 to 80 inches; about 60 percent strong brown (7.5YR 4/6) sandy loam (Bt); penetrated by tongues of light yellowish brown (10YR 6/4) sand (E); moderate medium subangular blocky structure; friable; few fine and medium roots; about 6 percent gravel; neutral.

The content of gravel and cobbles ranges from 0 to 15 percent throughout.

The A horizon has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 1 or 2.

The Bw horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 4 to 8. It is sand or loamy sand.

The E part of the E&Bt and B/E horizons has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 or 4. It is sand or loamy sand.

The Bt part of the E&Bt and B/E horizons has hue of 5YR to 10YR and value and chroma of 4 to 6. It consists of bands of loamy sand or sandy loam 1/4 inch to 4 inches thick. The combined thickness of the bands is more than 6 inches.

Kokosing Series

The Kokosing series consists of somewhat poorly drained soils that formed in sandy outwash over loamy till deposits. These soils are on till plains and moraines. Permeability is rapid in the upper part and moderate in the lower part. Slopes range from 0 to 3 percent.

Typical pedon of Kokosing sand, 0 to 3 percent slopes, 300 feet north and 800 feet west of the southeast corner of sec. 11, T. 23 N., R. 5 E.; USGS Hale topographic quadrangle; lat. 44 degrees 23 minutes 36.49 seconds N. and long. 83 degrees 47 minutes 21.49 seconds W.; in Plainfield Township:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) sand, light brownish gray (10YR 6/2) dry; weak medium granular structure; very friable; slightly acid; abrupt smooth boundary.

Bw1—9 to 15 inches; dark yellowish brown (10YR 4/6) sand; weak coarse subangular blocky structure; very friable; few fine distinct light brownish gray (10YR 6/2) iron depletions within the matrix; few medium faint yellowish brown (10YR 5/6) masses of iron accumulation within the matrix; very strongly acid; clear wavy boundary.

Bw2—15 to 23 inches; yellowish brown (10YR 5/6) sand; weak coarse subangular blocky structure; very friable; many medium distinct pale brown (10YR 6/3) iron depletions within the matrix; few fine faint dark yellowish brown (10YR 4/6) masses of iron accumulation within the matrix; very strongly acid; abrupt smooth boundary.

Bw3—23 to 27 inches; yellowish brown (10YR 5/4) sand; weak coarse subangular blocky structure; very friable; many medium distinct light brownish gray (10YR 6/2) iron depletions within the matrix; many medium distinct yellowish brown (10YR 5/6) masses of iron accumulation within the matrix; very strongly acid; clear wavy boundary.

2(E/B)—27 to 32 inches; about 70 percent pale brown (10YR 6/3) loamy sand (E), light gray (10YR 7/2) dry (E); surrounding peds of brown (7.5YR 4/4) loam (Bt); moderate coarse subangular blocky structure; friable; few fine faint gray (10YR 6/1) iron depletions; 5 percent gravel; very strongly acid; clear wavy boundary.

2(B/E)—32 to 38 inches; about 70 percent reddish brown (5YR 4/4) loam (Bt) with common distinct brown (7.5YR 4/4) clay films on faces of peds; surrounded by light brownish gray (10YR 6/2) sandy loam, light gray (10YR 7/2) dry (E); moderate medium subangular blocky structure; friable; few fine faint gray (10YR 6/1) iron depletions; 5 percent gravel; moderately acid; clear wavy boundary.

2Bt—38 to 53 inches; reddish brown (5YR 4/4) loam; moderate medium subangular blocky structure; friable; many faint brown (7.5YR 4/4) clay films on faces of peds; 5 percent gravel; many fine prominent strong brown (7.5YR 5/6) masses of iron accumulation; neutral; clear wavy boundary.

2C—53 to 80 inches; reddish brown (5YR 5/4) loam; massive; firm; few faint brown (7.5YR 4/4) clay films in cracks; 5 percent gravel; strongly effervescent; moderately alkaline.

The depth to loamy material ranges from 20 to 40 inches. The depth to carbonates ranges from 28 to more than 80 inches.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. It is sand or loamy sand.

The Bw horizon has value of 4 or 5 and chroma of 4 to 6. It is sand or loamy sand.

The E part of the 2(E/B) and 2(B/E) horizons has value of 5 or 6 and chroma of 2 or 3. It is loamy sand or sandy loam.

The Bt part of the 2(E/B) and 2(B/E) horizons has hue of 5YR or 7.5YR, value of 4 to 6, and chroma of 3 or 4.

The 2Bt horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is loam, clay loam, or sandy clay loam. The content of clay ranges from 25 to 35 percent.

The 2C horizon has hue of 7.5YR or 5YR, value of 3 to 5, and chroma of 4 or 5. It is loam, clay loam, or sandy clay loam.

Lacota Series

The Lacota series consists of poorly drained soils that formed in loamy lacustrine deposits over sandy outwash. These soils are on lake plains and outwash plains. Permeability is moderately slow in the upper part and rapid in the lower part. Slopes range from 0 to 2 percent.

Typical pedon of Lacota loam, 1,075 feet north and 200 feet west of the southeast corner of sec. 32, T. 21 N., R. 6 E.; USGS National City topographic quadrangle; lat. 44 degrees 9 minutes 56.14 seconds N. and long. 83 degrees 43 minutes 22.62 seconds W.; in Sherman Township:

A—0 to 10 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; many fine to coarse roots; slightly acid; clear smooth boundary.

Bg1—10 to 16 inches; grayish brown (2.5Y 5/2) loam; moderate medium subangular blocky structure; friable; common fine and medium roots; common medium prominent yellowish brown (10YR 5/4), few medium prominent strong brown (7.5YR 5/4), and few fine prominent brownish yellow (10YR 6/6) masses of iron accumulation; neutral; gradual wavy boundary.

Bg2—16 to 28 inches; grayish brown (2.5Y 5/2) clay loam; moderate medium subangular blocky structure; friable; common fine and medium roots; common medium prominent yellowish brown (10YR 5/4), few medium prominent strong brown (7.5YR 5/4), and few fine prominent brownish yellow (10YR 6/6) masses of iron accumulation; neutral; abrupt wavy boundary.

2C1—28 to 45 inches; brown (10YR 5/3) sand; single grain; loose; common fine faint yellowish brown (10YR 5/4) masses of iron accumulation; neutral; gradual wavy boundary.

2C2—45 to 60 inches; brown (10YR 5/3) sand; single grain; loose; lenses of gravelly sand 1 to 2 inches thick; common fine faint yellowish brown (10YR 5/4) masses of iron accumulation; strongly effervescent; moderately alkaline; gradual wavy boundary.

2Cg—60 to 80 inches; grayish brown (2.5Y 5/2) sand; single grain; loose; lenses of gravelly sand 1 to 2 inches thick; violently effervescent; moderately alkaline.

The depth to calcium carbonates ranges from 30 to 60 inches. The content of coarse fragments ranges from 0 to 5 percent throughout the profile.

The A horizon has value of 2 or 3 and chroma of 1 or 2.

The Bg horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2. It is loam, clay loam, or silty clay loam.

The 2C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2.

Leafriver Series

The Leafriver series consists of very poorly drained soils that formed in sandy lacustrine deposits and outwash. These soils are on lake plains, moraines, and outwash plains. Permeability is rapid. Slopes are 0 to 1 percent.

Typical pedon of Leafriver muck, 2,400 feet south and 90 feet east of the northwest corner of sec. 17, T. 22 N., R. 7 E.; USGS Tawas City topographic quadrangle; lat. 44 degrees 18 minutes 7.24 seconds N. and long. 83 degrees 37 minutes 23.74 seconds W.; in Tawas Township:

Oa—0 to 10 inches; muck, black (10YR 2/1) broken face and rubbed; about 25 percent fiber, less than 5 percent rubbed; moderate medium subangular blocky structure; friable; many fine and medium roots; strongly acid; abrupt smooth boundary.

A—10 to 14 inches; black (10YR 2/1) sand, gray (10YR 5/1) dry; moderate medium subangular blocky structure; friable; few fine roots; very strongly acid; clear smooth boundary.

Cg1—14 to 35 inches; dark brownish gray (10YR 4/2) sand; single grain; loose; very strongly acid; clear wavy boundary.

Cg2—35 to 60 inches; dark gray (10YR 4/1) sand; single grain; loose; very strongly acid; clear wavy boundary.

C—60 to 80 inches; brown (10YR 5/3) sand; single grain; loose; slightly acid.

The depth to free carbonates is more than 60 inches. The content of gravel ranges from 0 to 15 percent throughout the profile. The thickness of the organic layer ranges from 8 to less than 16 inches.

The Oa horizon has hue of 10YR or is neutral in hue. It has value of 2 and chroma of 0 or 1.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2.

The Cg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2.

Lupton Series

The Lupton series consists of very poorly drained soils that formed in organic deposits more than 51 inches thick. These soils are in depressions on lake plains, outwash plains, moraines, and till plains. Permeability ranges from moderately slow to moderately rapid. Slopes range from 0 to 2 percent.

Typical pedon of Lupton muck, in an area of Tawas-Lupton mucks, 2,200 feet north and 300 feet west of the southeast corner of sec. 1, T. 24 N., R. 8 E.; USGS Mikado topographic quadrangle; lat. 44 degrees 30 minutes 9.51 seconds N. and long. 83 degrees 24 minutes 10.71 seconds W.; in Oscoda Township:

Oa1—0 to 30 inches; muck (sapric material), black (5YR 2/1) broken face, dark reddish brown (5YR 2/2) rubbed; about 10 percent fibers, 0 percent rubbed; moderate fine granular structure; very friable; slightly acid; clear wavy boundary.

Oa2—30 to 38 inches; muck (sapric material), black (5YR 2/1) broken face and rubbed; about 10 percent fibers, 0 percent rubbed; moderate medium platy structure; very friable; slightly acid; clear wavy boundary.

Oa3—38 to 50 inches; muck (sapric material), black (5YR 2/1) broken face, dark reddish brown (5YR 2/2) rubbed; about 10 percent fibers, 5 percent rubbed; moderate fine granular structure; very friable; slightly acid; clear wavy boundary.

Oa4—50 to 80 inches; muck (sapric material), dark reddish brown (5YR 2/2) rubbed; about 10 percent fibers, 5 percent rubbed; moderate fine granular structure; very friable; slightly acid.

The thickness of the organic layers is more than 51 inches.

The organic material has hue of 5YR to 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 3.

Manary Series

The Manary series consists of somewhat poorly drained soils that formed in stratified silty and clayey lacustrine deposits. These soils are on lake plains. Permeability is slow. Slopes range from 0 to 3 percent.

Typical pedon of Manary silty clay loam (fig. 18), in an area of Manary-Iargo complex, 0 to 6 percent slopes; 2,250 feet south and 2,000 feet west of the northeast corner of sec. 21, T. 22 N., R. 6 E.; USGS Floyd Lake topographic quadrangle; lat. 44 degrees 17 minutes 9.53 seconds N. and long. 83 degrees 42 minutes 41.01 seconds W.; in Grant Township:

Ap—0 to 11 inches; black (10YR 2/1) silty clay loam, grayish brown (10YR 5/2) dry; moderate medium subangular blocky structure; friable; moderately alkaline; abrupt smooth boundary.

Bt—11 to 18 inches; brown (7.5YR 4/4) silty clay; moderate medium and coarse subangular blocky structure parting to strong fine subangular blocky; firm; few fine distinct dark brown (7.5YR 4/2) clay films on faces of peds; common coarse distinct strong brown (7.5YR 4/6) masses of iron accumulation and common medium prominent light brownish gray (10YR 6/2) iron depletions; moderately alkaline; gradual wavy boundary.

BC—18 to 29 inches; reddish brown (5YR 5/4) silty clay loam; strong coarse prismatic structure parting to strong medium and fine angular blocky; firm; few fine distinct light olive gray (5Y 6/2) silt coatings on faces of peds; few fine prominent white (10YR 8/2) carbonate coatings on faces of peds; strongly effervescent; common fine prominent yellowish red (5YR 5/6) masses of iron accumulation and greenish gray (5GY 6/1) iron depletions; strongly alkaline; clear smooth boundary.

C—29 to 80 inches; brown (7.5YR 5/4) and reddish brown (5YR 5/3) silty clay loam with thin strata of brown (7.5YR 5/4) and pale brown (10YR 6/3) loamy very fine sand; strata are 1 to 2 inches thick and 8 to 10 inches apart; massive with widely spaced vertical fractures; firm; stratification has weak medium platy structure; friable; common fine prominent greenish gray (5GY 6/1) and light olive gray (5Y 6/2) silt coatings on faces of peds; common fine prominent pinkish white (5YR 8/2) carbonate coatings on faces of peds; violently effervescent; moderately alkaline.

The parent material contains strata ranging from 1/8 inch to 2 inches in thickness. The content of coarse fragments ranges from 0 to 5 percent throughout the profile.

The Ap horizon has value of 2 or 3 and chroma of 1 to 3.

The Bt horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 4 to 6. It is silty clay or silty clay loam or is stratified. The content of clay ranges from 35 to 60 percent.

The C horizon has hue of 7.5YR to 2.5Y, value of 5 or 6, and chroma of 3 to 6. The material in this horizon is very stratified. The textures are fine sand, loamy very fine sand, silt, silt loam, clay loam, silty clay loam, silty clay, and clay.

McIvor Series

The McIvor series consists of somewhat poorly drained soils that formed in sandy outwash over clayey lacustrine deposits. These soils are on lake plains. They contain ortstein. Permeability is moderate in the ortstein and very slow in the substratum. Slopes range from 0 to 3 percent.

Typical pedon of McIvor sand (fig. 19), 0 to 3 percent slopes, 2,130 feet south and 520 feet east of the northwest corner of sec. 18, T. 21 N., R. 7 E.; USGS National City topographic quadrangle; lat. 44 degrees 12 minutes 53.44 seconds N. and long. 83 degrees 38 minutes 22.78 seconds W.; in Alabaster Township:

Oi—2 inches to 0; slightly decomposed hardwood leaf litter.

A—0 to 2 inches; dark gray (10YR 4/1) sand, gray (10YR 5/1) dry; weak fine granular structure; very friable; many fine to coarse roots; extremely acid; abrupt smooth boundary.

E1—2 to 8 inches; pinkish gray (7.5YR 7/2) sand, pinkish gray (7.5YR 7/2) dry; weak moderate subangular blocky structure; very friable; many fine to coarse roots; extremely acid; clear wavy boundary.

E2—8 to 11 inches; pinkish gray (7.5YR 7/2) sand, pinkish gray (7.5YR 7/2) dry; weak moderate subangular blocky structure; very friable; many fine to coarse roots; few fine and medium distinct light brownish gray (10YR 6/2) iron depletions; extremely acid; clear wavy boundary.

E3—11 to 18 inches; white (10YR 8/2) sand, white (10YR 8/2) dry; weak moderate subangular blocky structure; very friable; few fine to coarse roots; many medium and coarse distinct light yellowish brown (10YR 6/4) masses of iron accumulation; extremely acid; clear smooth boundary.

Bhsm—18 to 24 inches; sand, 60 percent dark reddish brown (5YR 3/3) and 40 percent yellowish brown (10YR 5/6); massive; firm; 90 percent of horizon occupied by strongly cemented ortstein; few fine prominent light brownish gray (10YR 6/2) and many medium and coarse prominent brownish gray (10YR 5/2) iron depletions; extremely acid; clear smooth boundary.

BC—24 to 29 inches; dark yellowish brown (10YR 4/4) sand; single grain; loose; many medium and coarse distinct brownish yellow (10YR 6/6) masses of iron accumulation; extremely acid; clear smooth boundary.

C1—29 to 56 inches; pale brown (10YR 6/3) sand; single grain; loose; extremely acid; abrupt smooth boundary.

2C2—56 to 80 inches; reddish brown (5YR 5/4) silty clay; massive; firm; strongly effervescent; slightly alkaline.

The thickness of the sandy material ranges from 52 to 60 inches.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 to 4 and chroma of 0 or 1.

The E horizon has hue of 10YR or 7.5YR, value of 5 to 8, and chroma of 1 to 3.

The Bhsm or Bsm horizon has hue of 10YR, 7.5YR, 5YR, or 2.5YR, value of 2 to 5, and chroma of 2 to 6. Cementation ranges from weak to strong. Some pedons have a Bs horizon below the Bhsm or Bsm horizon. The Bs horizon, if it occurs, has hue of 7.5YR, value of 5, and chroma of 6.

The BC horizon has value of 4 or 5 and chroma of 3 to 8.

The C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 or 4. Some pedons have an Ab horizon.

The 2C horizon has hue of 7.5YR or 5YR. It is clay loam or silty clay.

Meehan Series

The Meehan series consists of somewhat poorly drained soils that formed in sandy outwash. These soils are on stream terraces, beach ridges, and outwash plains. Permeability is rapid. Slopes range from 0 to 3 percent.

Typical pedon of Meehan sand, 0 to 3 percent slopes, 20 feet north and 400 feet east of the southwest corner of sec. 10, T. 24 N., R. 9 E.; USGS Oscoda topographic quadrangle; lat. 44 degrees 28 minutes 57.27 seconds N. and long. 83 degrees 20 minutes 27.04 seconds W.; in Oscoda Township:

Oa—0 to 1 inch; undecomposed leaf litter.

A—1 to 3 inches; very dark gray (10YR 3/1) sand, gray (10YR 5/1) dry; weak fine granular structure;

Figure 16.—Profile of an Algonquin soil. The gray colors are the result of gleying on the faces of peds. Depth is marked in feet.

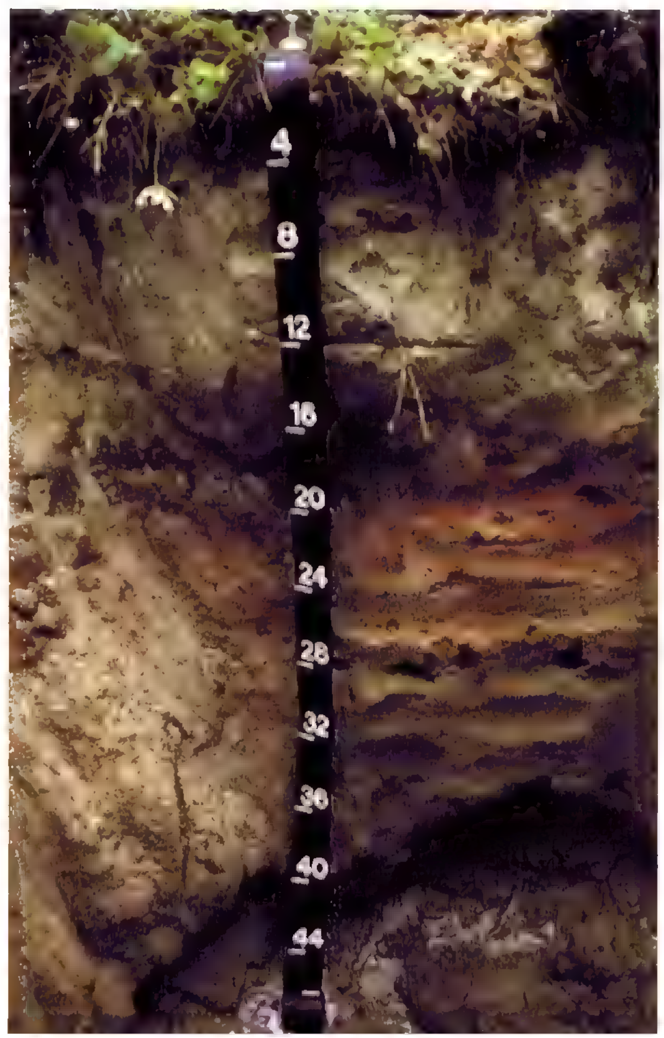

Figure 17.—Profile of a Finch soil. Ortstein is between depths of 14 and 20 inches. The water table at a depth of about 40 inches is causing sloughing at the bottom of the pit. Depth is marked in inches.

Figure 18.—Profile of a Mañary soil. The mollic epipedon extends to a depth of about 11 inches, and the Bt horizon is directly below the plow layer. Carbonate coatings are visible in the large gray area at a depth of about 56 inches. Depth is marked in inches.

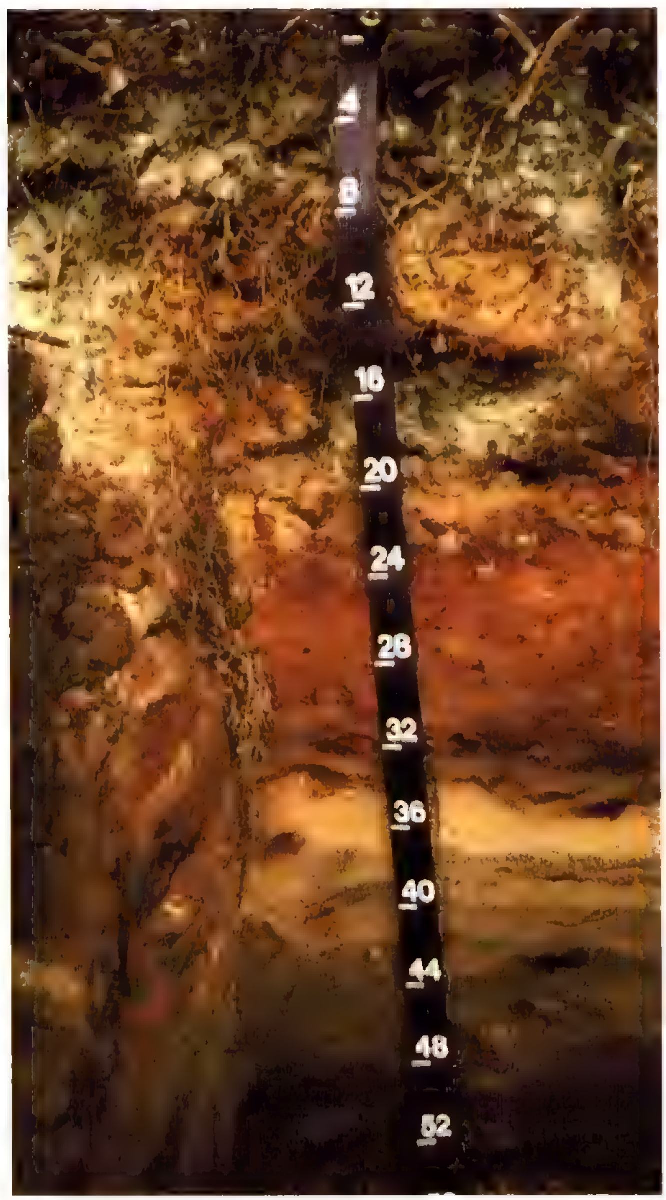

Figure 19.—Profile of a McIvor soil. The upper 20 inches has been mixed as a result of the uprooting of trees. A continuous layer of ortstein is between depths of 23 and 32 inches. Clay material is at a depth of about 54 inches. Depth is marked in inches.

Figure 20.—Profile of a Nester soil. A glossic horizon is just below the surface layer. Depth is marked in 4-inch increments.

Figure 21.—Profile of a Proper soil. Ortstein is at a depth of 12 to 20 inches. The ortstein is broken and in places occurs in columns. Depth is marked in inches.

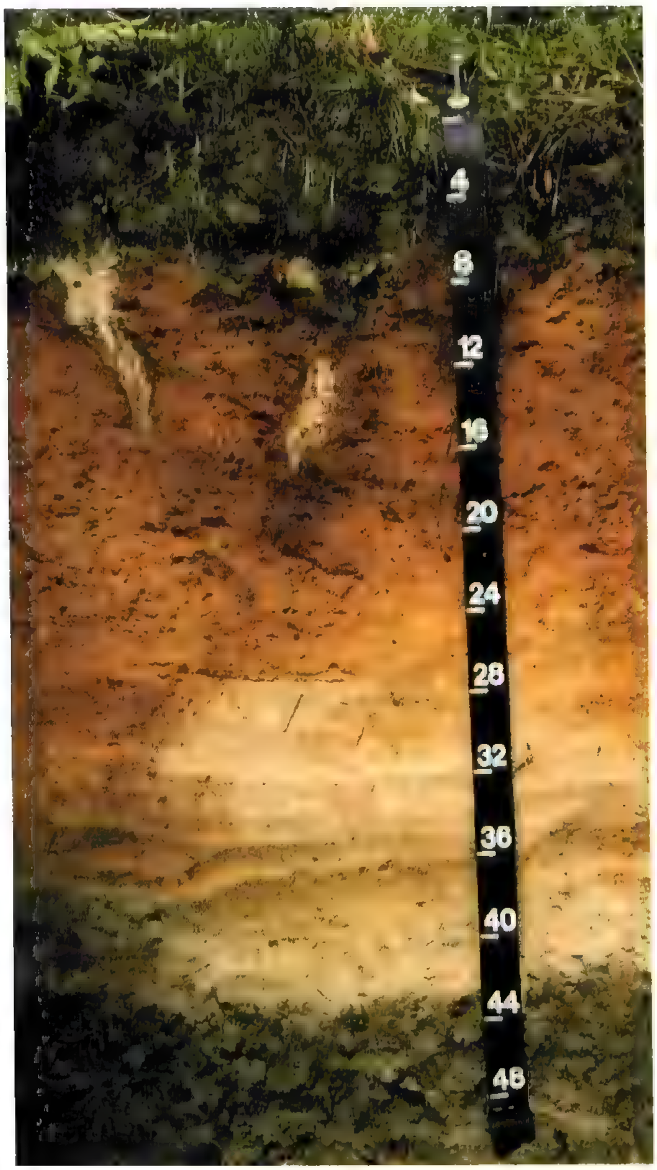

Figure 22.—Profile of a Tacoda soil. Depth to the clay layer ranges from 40 to 60 inches. Some of the E horizon has been disturbed and mixed into the surface layer. Depth is marked in inches.

Figure 23.—Profile of a Whittemore soil. The depth to clay ranges from 20 to 40 inches. The dark reddish material at a depth of 10 to 15 inches is a nearly level, continuous layer of ortstein. Depth is marked in feet.

very friable; common fine and medium roots; extremely acid; abrupt smooth boundary.

E—3 to 10 inches; pale brown (10YR 6/3) sand, very pale brown (10YR 7/3) dry; single grain; loose; common fine and medium roots; extremely acid; abrupt smooth boundary.

Bw1—10 to 13 inches; brown (10YR 4/3) sand; weak medium subangular blocky structure; very friable; common fine and medium roots; common medium prominent strong brown (7.5YR 4/6) masses of iron accumulation; extremely acid; clear wavy boundary.

Bw2—13 to 22 inches; yellowish brown (10YR 5/4) sand; weak medium subangular blocky structure; very friable; common fine and medium roots; common medium prominent strong brown (7.5YR 5/6) masses of iron accumulation; extremely acid; clear wavy boundary.

BC—22 to 44 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; common medium distinct yellowish brown (10YR 5/6) masses of iron accumulation and common medium distinct light brownish gray (10YR 6/2) iron depletions; extremely acid; clear wavy boundary.

C—44 to 80 inches; brown (10YR 5/3) sand; single grain; loose; thin strata of fine sand with 2 percent gravel; 10 percent gravel in medium sand; extremely acid.

Redoximorphic accumulations are typically below the E horizon. Redox depletions are within a depth of 40 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. It is sand or loamy sand.

The E horizon has value of 4 to 6 and chroma of 2 or 3. It is sand or loamy sand.

The Bw horizon typically has hue of 10YR, but in some pedons it has hue of 7.5YR. It has value of 4 to 6 and chroma of 3 to 8. Some pedons have a Bg horizon, which has hue of 7.5YR or 10YR and value of 4 to 6.

The C horizon has hue of 10YR or 7.5YR, value of 4 to 7, and chroma of 3 or 4. Some pedons have a Cg horizon, which has hue of 10YR or 7.5YR and value of 4 to 7.

Menominee Series

The Menominee series consists of well drained soils that formed in sandy outwash over loamy till. These soils are on till plains and moraines. Permeability is rapid in the upper part and moderately slow in the lower part. Slopes range from 12 to 35 percent.

Typical pedon of Menominee sand, 12 to 18 percent slopes, 300 feet north and 2,200 feet east of the southwest corner of sec. 30, T. 24 N., R. 5 E.; USGS South Branch topographic quadrangle; lat. 44 degrees 26 minutes 15.61 seconds N. and long. 83 degrees 52 minutes 34.52 seconds W.; in Plainfield Township:

A—0 to 4 inches; very dark grayish brown (10YR 3/2) sand, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; many medium and fine and few coarse roots; extremely acid; clear smooth boundary.

E—4 to 7 inches; grayish brown (10YR 5/2) sand, white (10YR 8/2) dry; weak medium subangular blocky structure; very friable; many fine and medium and few coarse roots; extremely acid; clear smooth boundary.

Bs1—7 to 18 inches; dark brown (7.5YR 4/4) sand; weak medium subangular blocky structure; very friable; many fine and medium and few coarse roots; extremely acid; clear wavy boundary.

Bs2—18 to 23 inches; dark yellowish brown (10YR 4/6) sand; weak medium subangular blocky structure; very friable; many medium and few coarse roots; very strongly acid; clear wavy boundary.

2B/E—23 to 39 inches; 70 percent brown (7.5YR 5/4) clay loam (Bt); surrounded by light brownish gray (10YR 6/2) sandy loam (E), light gray (10YR 7/1) dry; strong medium angular blocky structure; firm; few fine roots; common distinct brown (7.5YR 5/4) clay films; strongly acid; clear wavy boundary.

2Bt—39 to 59 inches; reddish brown (5YR 4/4) clay loam; weak coarse subangular blocky structure; firm; few fine roots; common distinct reddish brown (5YR 4/4) clay films on faces of peds; neutral; clear wavy boundary.

2C—59 to 80 inches; brown (7.5YR 5/4) loam; massive; firm; common white (10YR 8/2) carbonate coatings in cracks; slightly effervescent; moderately alkaline.

The thickness of the sand ranges from 20 to 40 inches.

The A horizon has hue of 10YR or 7.5YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. Pedons in cultivated areas have an Ap horizon, which has hue of 10YR or 7.5YR and value and chroma of 2 or 3.

The E horizon has hue of 10YR or 7.5YR, value of 4 to 7, and chroma of 2 or 3. It is sand, fine sand, loamy sand, or loamy fine sand.

The Bs1 horizon has value and chroma of 3 or 4. It is sand or fine sand.

The Bs2 horizon has hue of 7.5YR or 10YR and value of 4 or 5. It is sand or fine sand.

Some pedons have an E′ horizon. This horizon, if it occurs, has hue of 10YR or 7.5YR, value of 4 to 7, and chroma of 2 to 4.

The E part of the 2B/E horizon has hue of 10YR or 7.5YR, value of 4 to 7 moist and 6 to 8 dry, and chroma of 2 or 3 moist and dry.

The B part of the 2B/E horizon and the 2Bt horizon have hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 3 to 6. The texture is clay loam or silty clay loam.

Some pedons have a 2BC horizon. This horizon, if it occurs, has the same colors and textures as those of the 2Bt horizon. The content of clay ranges from 18 to 35 percent.

The 2C horizon has hue of 10YR to 5YR, value of 4 to 6, and chroma of 2 to 6. It is clay loam, loam, or silty clay loam.

Mongo Series

The Mongo series consists of well drained soils that formed in silty and clayey lacustrine deposits. These soils are on dissected lake plains. Permeability is very slow. Slopes range from 12 to 35 percent.

Typical pedon of Mongo loam, 18 to 35 percent slopes, 250 feet south and 1,350 feet east of the northwest corner of sec. 33, T. 22 N., R. 7 E.; USGS Tawas City topographic quadrangle; lat. 44 degrees 15 minutes 49.65 seconds N. and long. 83 degrees 35 minutes 51.97 seconds W.; in Tawas Township:

A—0 to 5 inches; very dark grayish brown (10YR 3/2) loam, light brownish gray (10YR 6/2) dry; moderate medium subangular blocky structure; friable; common fine and few medium roots; about 1 percent gravel; neutral; clear wavy boundary.

B/E1—5 to 8 inches; about 80 percent dark brown (7.5YR 4/4) silty clay (Bt); surrounding light brownish gray (10YR 6/2) silty clay loam (E), light gray (10YR 7/2) dry; strong medium subangular blocky structure; firm; common fine and few medium roots; about 1 percent gravel; neutral; clear wavy boundary.

B/E2—8 to 12 inches; about 90 percent dark brown (7.5YR 4/4) silty clay (Bt); coated with brown (10YR 5/4) silty clay loam (E), pale brown (10YR 6/3) dry; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common fine and few medium roots; about 1 percent gravel; neutral; clear wavy boundary.

Bt—12 to 21 inches; dark brown (7.5YR 4/4) silty clay; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common fine and few medium roots; about 1 percent coarse fragments; many distinct dark brown (7.5YR 3/4) clay flows; slightly alkaline; clear wavy boundary.

BC—21 to 55 inches; brown (7.5YR 5/4) silty clay loam; moderate very coarse prismatic structure parting to strong medium subangular blocky; brown (7.5YR 4/4) clay flows on vertical and horizontal faces of peds; firm; violently effervescent; moderately alkaline; clear wavy boundary.

C—55 to 80 inches; stratified, brown (7.5YR 5/4) and reddish brown (5YR 5/4) silty clay loam; massive; firm; common prominent light gray (10YR 7/2) carbonate coatings on vertical faces of peds; violently effervescent; fine stratification of sand grains; moderately alkaline.

The depth to free carbonates ranges from 20 to 50 inches. The depth to the stratified C horizon ranges from 40 to 60 inches. The content of gravel ranges from 0 to 5 percent throughout the profile.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 or 3. It is loam, silt loam, or silty clay loam.

The E part of the B/E horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2 to 4. Some pedons have an E horizon.

The Bt part of the B/E horizon and the Bt horizon have hue of 5YR or 7.5YR, value of 4 to 6, and chroma of 3 or 4. The texture is silty clay loam or silty clay. The content of clay ranges from 35 to 60 percent. The content of sand coarser than very fine sand ranges from 0 to 15 percent.

The BC and C horizons have hue of 5YR, 7.5YR, or 10YR, value of 3 to 6, and chroma of 3 or 4. They are silty clay or silty clay loam. In some pedons they have thin strata of silty material 1/8 to 1/2 inch thick.

Morganlake Series

The Morganlake series consists of moderately well drained soils that formed in sandy outwash over loamy till. These soils are on till plains and moraines. Permeability is moderately rapid in the sandy material and moderately slow in the till. Slopes range from 0 to 12 percent.

Typical pedon of Morganlake sand, 0 to 6 percent slopes, 1,800 feet north and 50 feet east of the southwest corner of sec. 20, T. 23 N., R. 6 E.; USGS Floyd Lake topographic quadrangle; lat. 44 degrees 22 minutes 8.69 seconds N. and long. 83 minutes 22 minutes 41.34 seconds W.; in Plainfield Township:

A—0 to 4 inches; black (N 2/0) sand, very dark gray (10YR 3/1) dry; weak fine granular structure; very friable; many fine and medium roots; very strongly acid; abrupt wavy boundary.

E—4 to 6 inches; light brownish gray (10YR 6/2) sand, light gray (10YR 7/2) dry; weak medium subangular blocky structure; very friable; many fine and medium roots; extremely acid; clear wavy boundary.

Bs1—6 to 13 inches; dark brown (7.5YR 4/4) sand; weak medium subangular blocky structure; friable; many medium and few fine roots; extremely acid; clear wavy boundary.

Bs2—13 to 23 inches; brown (7.5YR 5/4) sand; weak medium subangular blocky structure; very friable; few fine roots; very strongly acid; clear wavy boundary.

E′—23 to 29 inches; light brownish gray (10YR 6/2) loamy sand, light brownish gray (10YR 6/2) dry; weak medium subangular blocky structure; very friable; few fine roots; few fine faint strong brown (7.5YR 4/6) masses of iron accumulation; very strongly acid; abrupt wavy boundary.

2B/E—29 to 47 inches; about 80 percent dark brown (7.5YR 4/4) clay loam (Bt); surrounded by pinkish gray (7.5YR 6/2) sandy loam (E), pinkish gray (7.5YR 7/2) dry; moderate medium subangular blocky structure; firm; few fine distinct strong brown (7.5YR 5/6) masses of iron accumulation; about 3 percent gravel; moderately acid; clear wavy boundary.

2C—47 to 80 inches; reddish brown (7.5YR 5/3) clay loam; moderate medium subangular blocky structure; firm; few prominent light gray (10YR 7/1) masses of carbonates on the interior of peds; few fine and medium prominent brownish yellow (10YR 6/6) masses of iron accumulation; about 3 percent gravel; slightly alkaline.

Thickness of the sandy material ranges from 20 to 40 inches. The content of gravel ranges from 0 to 5 percent in the sandy material and from 3 to 15 percent in the substratum. The depth to carbonates ranges from 40 to 60 inches.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2.

The E horizon has hue of 10YR or 7.5YR and value of 4 to 6.

The Bs1 horizon has value of 3 to 5 and chroma of 3 or 4.

The Bs2 horizon has hue of 7.5YR or 10YR and value and chroma of 4 to 6.

The E′ horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 or 3. The E part of the 2B/E horizon has colors similar to those of the E′ horizon. The texture is sandy loam or loam.

The Bt part of the 2B/E horizon has value of 4 or 5 and chroma of 4 to 6. It is silty clay loam or clay loam.

The 2C horizon has value of 4 to 6. It is silty clay loam or clay loam. The content of clay ranges from 18 to 35 percent.

Negwegon Series

The Negwegon series consists of moderately well drained soils that formed in stratified silty and clayey lacustrine deposits. These soils are on lake plains. Permeability is very slow. Slopes range from 0 to 12 percent.

Typical pedon of Negwegon silt loam, 6 to 12 percent slopes, 2,100 feet south and 450 feet east of the northwest corner of sec. 33, T. 22 N., R. 7 E.; USGS Tawas City topographic quadrangle; lat. 44 degrees 15 minutes 32.55 seconds N. and long. 83 degrees 36 minutes 5.05 seconds W.; in Tawas Township:

A—0 to 6 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium subangular blocky structure; friable; common fine and medium roots; 1 percent gravel; moderately acid; clear wavy boundary.

B/E—6 to 10 inches; about 60 percent dark brown (7.5YR 4/4) clay (Bt); surrounded by pale brown (10YR 6/3) silt loam (E), light gray (10YR 7/2) dry; moderate medium subangular blocky structure; firm; common fine roots; 1 percent gravel; moderately acid; clear irregular boundary.

Bt1—10 to 20 inches; dark brown (7.5YR 4/4) clay; moderate medium prismatic structure parting to strong medium angular blocky; firm; common fine roots; about 1 percent gravel; common faint dark brown (7.5YR 4/4) clay flows on faces of peds; moderately acid; clear wavy boundary.

Bt2—20 to 34 inches; strong brown (7.5YR 4/6) clay; moderate medium angular blocky structure; firm; about 1 percent gravel; common faint dark brown (7.5YR 4/4) clay flows on faces of peds; slightly effervescent; slightly alkaline; clear wavy boundary.

C1—34 to 61 inches; light brown (7.5YR 6/4) silty clay loam; massive; friable; about 1 percent gravel; common prominent pinkish gray (7.5YR 7/2) carbonate coatings on vertical faces of peds; common medium faint reddish yellow (7.5YR 6/6) masses of iron accumulation; strongly effervescent; moderately alkaline; clear wavy boundary.

C2—61 to 80 inches; light brown (7.5YR 6/4) silty clay loam; massive; friable; about 1 percent gravel; common prominent pinkish gray (7.5YR 7/2) and greenish gray (5GY 6/1) carbonate coatings on vertical faces of peds; common medium faint reddish yellow (7.5YR 6/6) masses of iron accumulation and common fine and medium greenish gray (5GY 6/1) iron depletions; strongly effervescent; moderately alkaline.

The depth to free carbonates ranges from 25 to 50 inches. The content of gravel ranges from 0 to 5 percent throughout the profile.

The Ap horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 1 or 2. It is silt loam or silty clay loam.

The E part of the E/B horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2 or 3.

The Bt part of the E/B horizon and the Bt horizon have hue of 5YR or 7.5YR, value of 4 to 6, and chroma of 3 or 4. The texture is silty clay loam, clay, or silty clay. The content of clay ranges from 35 to 60 percent.

The C horizon has hue of 5YR to 10YR, value of 3 to 6, and chroma of 3 or 4. It is silty clay, silt loam, or silty clay loam or is stratified with these textures.

Nester Series

The Nester series consists of moderately well drained soils that formed in moderately fine textured till. These soils are on till plains and moraines. Permeability is slow. Slopes range from 1 to 12 percent.

Typical pedon of Nester sandy loam (fig. 20), 1 to 6 percent slopes, 2,540 feet south and 300 feet west of the northeast corner of sec. 9, T. 22 N., R. 5 E.; USGS Hale SE topographic quadrangle; lat. 44 degrees 18 minutes 47.03 seconds N. and long. 83 degrees 51 minutes 15.27 seconds W.; in Reno Township:

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) sandy loam, light brownish gray (10YR 6/2) dry; weak medium subangular blocky structure; friable; few fine roots; 5 percent gravel; moderately acid; abrupt smooth boundary.

E/B—11 to 17 inches; about 60 percent light brownish gray (10YR 6/2) sandy loam (E), light gray (10YR 7/2) dry; surrounding dark brown (7.5YR 4/4) clay loam (Bt); weak medium subangular blocky structure; friable; few fine roots; very few discontinuous distinct reddish brown (5YR 4/3) clay films on vertical faces of peds; about 5 percent gravel; neutral; clear wavy boundary.

Bt—17 to 34 inches; brown (7.5YR 4/4) clay loam; moderate medium subangular blocky structure; firm; few fine roots; common distinct reddish brown (5YR 4/4) clay films on horizontal and vertical faces of peds; about 5 percent gravel; neutral; clear wavy boundary.

C1—34 to 50 inches; strong brown (7.5YR 4/6) clay loam; weak coarse subangular blocky structure; friable; few fine faint strong brown (7.5YR 5/6) masses of iron accumulation; few prominent light gray (10YR 7/2) carbonate coatings on vertical faces of peds; about 5 percent gravel; slightly effervescent; slightly alkaline; clear wavy boundary.

C2—50 to 80 inches; brown (7.5YR 5/4) clay loam; weak coarse subangular blocky structure; friable; few prominent light gray (10YR 7/2) carbonate coatings on vertical faces of peds; about 5 percent gravel; strongly effervescent; moderately alkaline.

The depth to carbonates ranges from 20 to 40 inches. The content of gravel ranges from 1 to 10 percent throughout the profile.

The Ap horizon has chroma of 1 or 2.

The E part of the E/B horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2 or 3. It is sandy loam or loam.

The Bt part of the E/B horizon and the Bt horizon have hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. The texture is clay loam, silty clay loam, or clay. The content of clay ranges from 35 to 60 percent.

The C horizon has hue of 5YR or 7.5YR, value of 5 or 6, and chroma of 3 or 4. It is clay loam or silty clay loam.

Proper Series

The Proper series consists of moderately well drained soils that formed in sandy outwash and eolian deposits. These soils are on beach ridges and dunes. Permeability is rapid. Slopes range from 0 to 8 percent.

Typical pedon of Proper sand (fig. 21), in an area of Crowell-Proper complex, 4 to 25 percent slopes, 150 feet north and 2,000 feet west of the southeast corner of sec. 18, T. 21 N., R. 7 E.; USGS National City topographic quadrangle; lat. 44 degrees 12 minutes 23.41 seconds N. and long. 83 degrees 37 minutes 45.05 seconds W.; in Alabaster Township:

Oi—0 to 2 inches; black (N 2/0), partially decomposed leaf litter.

A—2 to 5 inches; dark grayish brown (10YR 4/2) sand, light grayish brown (10YR 6/2) dry; weak fine granular structure; very friable; many fine and

medium roots; extremely acid; clear wavy boundary.

E—5 to 12 inches; grayish brown (10YR 5/2) sand, very pale brown (10YR 7/2) dry; pockets of light gray (10YR 7/2) uncoated sand grains; weak fine granular structure; very friable; many fine and medium and common coarse roots; extremely acid; gradual wavy boundary.

Bs1—12 to 19 inches; dark brown (7.5YR 4/4) sand; weak fine granular structure; very friable; few coarse and common fine and medium roots between columns of ortstein; columns of strongly cemented ortstein 3 to 18 inches wide extend into the Bs2 horizon; ortstein columns are 1 to 17 inches apart and occupy 52 percent of the horizon; extremely acid; gradual wavy boundary.

Bs2—19 to 26 inches; brownish yellow (10YR 6/6) sand; single grain; loose; few fine and medium roots between tongues of ortstein; columns of weakly cemented ortstein 2 to 22 inches wide extend through this horizon from the Bs1 horizon and into the BC horizon; ortstein columns are 3 to 6 inches apart and occupy 67 percent of the horizon; extremely acid; clear wavy boundary.

BC—26 to 40 inches; brownish yellow (10YR 6/6) sand; single grain; loose; columns of weakly cemented ortstein 2 to 4 inches wide extending from the Bs2 horizon; ortstein columns are 9 to 16 inches apart and occupy 15 percent of the horizon; common fine faint light yellowish brown (10YR 6/4) masses of iron accumulation; extremely acid; clear wavy boundary.

C1—40 to 55 inches; pale brown (10YR 6/3) sand; single grain; loose; common fine distinct yellowish brown (10YR 5/6) masses of iron accumulation; extremely acid; clear wavy boundary.

C2—55 to 80 inches; light yellowish brown (10YR 6/2) sand; single grain; loose; common fine prominent yellowish brown (10YR 5/6) masses of iron accumulation; extremely acid.

Reaction ranges from moderately acid to neutral in the solum.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 to 4 and chroma of 0 to 2.

The E horizon has hue of 10YR or 7.5YR, value of 4 to 7, and chroma of 2 or 3.

The Bs1 horizon has value of 3 or 4. The content of ortstein ranges from 50 to 70 percent. The ortstein occurs as tongues.

The Bs2 horizon has hue of 7.5YR or 10YR, value of 3 to 6, and chroma of 4 to 6.

The BC horizon has chroma of 4 to 6.

The C horizon has value of 6 or 7 and chroma of 2 to 4.

Rollaway Series

The Rollaway series consists of very poorly drained soils that formed in stratified sandy to silty alluvium over clayey lacustrine deposits. These soils are on flood plains. Permeability is moderate in the alluvium and very slow in the clayey material. Slopes range from 0 to 2 percent.

Typical pedon of Rollaway muck, 140 feet south and 2,210 feet west of the northeast corner of sec. 22, T. 27 N., R. 9 E.; USGS Harrisville topographic quadrangle; lat. 44 degrees 43 minutes 43 seconds N. and long. 83 degrees 19 minutes 53 seconds W.; in Haynes Township, Alcona County:

Oa—0 to 9 inches; muck (sapric material), very dark gray (10YR 3/1) broken face, black (10YR 2/1) rubbed; about 30 percent fiber, 5 percent rubbed; weak fine granular structure; friable; many fine roots; about 15 percent mineral material; slightly acid; abrupt smooth boundary.

A—9 to 13 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; moderate medium subangular blocky structure; friable; many fine roots; common fine prominent yellowish red (5YR 4/6) and dark reddish brown (5YR 3/4) masses of iron accumulation; slightly acid; abrupt smooth boundary.

Cg1—13 to 18 inches; dark gray (10YR 4/1) silt loam; weak medium platy structure; friable; common fine prominent strong brown (7.5YR 4/6) masses of iron accumulation; neutral; abrupt smooth boundary.

Cg2—18 to 55 inches; dark grayish brown (10YR 4/2) and black (10YR 2/1) loamy sand and sandy loam; massive; friable; neutral; abrupt smooth boundary.

2Cg3—55 to 80 inches; brown (7.5YR 5/2) silty clay; massive; firm; strongly effervescent; moderately alkaline.

The depth to carbonates ranges from 40 to 60 inches.

The Oa horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1.

The Cg horizon has hue of 7.5YR or 10YR, value of 2 to 5, and chroma of 1 to 3. It is stratified loamy sand to silt loam.

The 2Cg horizon is silty clay or clay.

Rubicon Series

The Rubicon series consists of excessively drained soils that formed in sandy outwash. These soils are on

outwash plains, stream terraces, till plains, and moraines. Permeability is rapid. Slopes range from 0 to 70 percent.

Typical pedon of Rubicon sand, 0 to 6 percent slopes, 300 feet north and 100 feet east of the southwest corner of sec. 15, T. 21 N., R. 5 E.; USGS Whittemore topographic quadrangle; lat. 44 degrees 12 minutes 20.03 seconds N. and long. 83 degrees 49 minutes 21.60 seconds W.; in Burleigh Township:

Oi—0 to 1 inch; undecomposed pine needles.

A—1 to 4 inches; black (N 2/0) sand, dark gray (10YR 4/1) dry; weak fine granular structure; very friable; common medium and many fine and very fine roots; strongly acid; clear wavy boundary.

E—4 to 9 inches; gray (5YR 6/1) sand, light gray (5YR 7/1) dry; single grain; loose; few medium and common fine and very fine roots; very strongly acid; clear wavy boundary.

Bs1—9 to 16 inches; dark brown (7.5YR 3/4) sand; weak medium subangular blocky structure; very friable; common fine and very fine roots; columns of dark brown (7.5YR 3/4), weakly cemented ortstein extend into the Bs2 horizon; ortstein occupies 20 percent of the horizon; extremely acid; clear irregular boundary.

Bs2—16 to 24 inches; strong brown (7.5YR 4/6) sand; weak medium subangular blocky structure; very friable; few fine and medium roots; columns of weakly cemented, dark brown (7.5YR 3/4) ortstein extend through this horizon from the Bs1 horizon and into the BC horizon; ortstein occupies 20 percent of the horizon; strongly acid; gradual wavy boundary.

BC—24 to 41 inches; light yellowish brown (10YR 6/6) sand; single grain; loose; columns of weakly cemented, dark brown (7.5YR 3/4) ortstein extend into this horizon from the Bs1 horizon; ortstein occupies 20 percent of the horizon; very strongly acid; gradual wavy boundary.

C—41 to 80 inches; very pale brown (10YR 7/3) sand; single grain; loose; strongly acid.

The content of gravel ranges from 0 to 5 percent throughout.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 3.

The E horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 1 or 2.

The Bs1 horizon has chroma of 3 or 4.

The Bs2 horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 8.

The C horizon has value of 4 to 7 and chroma of 3 to 6.

Selkirk Series

The Selkirk series consists of somewhat poorly drained soils that formed in clayey till. These soils are on till plains and moraines. Permeability is slow. Slopes range from 0 to 4 percent.

Typical pedon of Selkirk loam, 0 to 4 percent slopes, 1,120 feet south and 60 feet west of the northeast corner of sec. 8, T. 21 N., R. 5 E.; USGS Whittemore topographic quadrangle; lat. 44 degrees 13 minutes 52.21 seconds N. and long. 83 degrees 50 minutes 38.41 seconds W.; in Burleigh Township:

Ap—0 to 9 inches; dark brown (10YR 3/3) loam, light brownish gray (10YR 6/2) dry; moderate medium subangular blocky structure; friable; common medium and many very fine and fine roots; 2 percent gravel; extremely acid; abrupt smooth boundary.

E/B—9 to 15 inches; about 80 percent pale brown (10YR 6/3) sandy loam (E), light gray (10YR 7/2) dry; surrounding remnants of yellowish brown (10YR 5/4) loam (Bt); moderate medium subangular blocky structure; friable; few medium and common very fine and fine roots; common fine distinct brown (7.5YR 5/4) masses of iron accumulation; 5 percent gravel; moderately acid; clear irregular boundary.

Bt—15 to 21 inches; dark brown (7.5YR 4/4) clay; moderate medium subangular blocky structure; firm; few medium and common very fine roots; many distinct dark brown (7.5YR 3/4) clay films on vertical and horizontal faces of peds; few fine prominent gray (5Y 6/1) iron depletions; 5 percent gravel; slightly acid; clear wavy boundary.

BC—21 to 28 inches; brown (7.5YR 5/4) clay; moderate fine and medium subangular blocky structure; firm; few very fine and medium roots; common distinct dark brown (7.5YR 3/4) clay films on vertical and horizontal faces of peds; common fine prominent gray (5Y 6/1) iron depletions and common fine and medium faint strong brown (7.5YR 4/6) masses of iron accumulation; 5 percent gravel; slightly effervescent; slightly acid; clear wavy boundary.

C1—28 to 55 inches; light yellowish brown (10YR 6/4) clay; strong medium and coarse subangular blocky structure; very firm; common prominent white (10YR 8/1) carbonate coatings on vertical and horizontal faces of peds; few fine distinct gray (10YR 6/1) iron depletions and few fine faint yellowish brown (10YR 5/6) masses of iron accumulation; 5 percent gravel; violently effervescent; moderately alkaline; clear wavy boundary.

C2—55 to 80 inches; brown (7.5YR 5/4) clay; massive; very firm; common prominent white (10YR 8/1) carbonate coatings on vertical and horizontal faces of peds; common medium distinct brownish yellow (10YR 6/6) masses of iron accumulation; 5 percent gravel; violently effervescent; moderately alkaline.

The depth to carbonates ranges from 20 to 35 inches.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It is sandy loam, fine sandy loam, or loam.

The Bt part of the B/E horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 3 or 4. It is loam or clay loam. The E part has chroma of 2 or 3. It is sandy loam or loamy sand.

The Bt horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is clay or silty clay. The content of clay ranges from 45 to 60 percent.

The C horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 or 4. It is clay or silty clay.

Sims Series

The Sims series consists of poorly drained soils that formed in clayey till. These soils are on till plains and moraines. Permeability is slow. Slopes range from 0 to 2 percent.

Typical pedon of Sims loam, 580 feet north and 220 feet east of the southwest corner of sec. 9, T. 23 N., R. 5 E.; USGS Hale topographic quadrangle; lat. 44 degrees 23 minutes 36.49 seconds N. and long. 83 degrees 50 minutes 39.04 seconds W.; in Plainfield Township:

A—0 to 5 inches; black (10YR 2/1) loam, dark grayish brown (10YR 4/2) dry; moderate medium subangular blocky structure; friable; common fine and medium and few coarse roots; less than 5 percent coarse fragments; moderately acid; clear wavy boundary.

Bg1—5 to 13 inches; dark gray (10YR 4/1) clay loam; moderate medium subangular blocky structure; firm; common fine and few coarse roots; less than 5 percent coarse fragments; common medium prominent yellowish brown (10YR 5/6) and common fine prominent strong brown (7.5YR 4/6) masses of iron accumulation; moderately acid; clear wavy boundary.

Bg2—13 to 47 inches; gray (5Y 5/1) clay loam; moderate medium subangular blocky structure; firm; less than 5 percent coarse fragments; common coarse prominent strong brown (7.5YR 4/6 and 5/8) and common medium prominent reddish brown (5YR 5/3) masses of iron accumulation and many coarse prominent greenish gray (5GY 6/1) iron depletions; slightly acid; clear wavy boundary.

C—47 to 80 inches; light reddish brown (5YR 6/3) clay loam; massive; firm; common medium and coarse prominent strong brown (7.5YR 4/6) and common medium prominent yellowish brown (10YR 5/6) masses of iron accumulation and many fine to coarse prominent greenish gray (5GY 6/1) iron depletions; strongly effervescent; slightly alkaline.

The depth to carbonates ranges from 20 to 50 inches. The content of gravel ranges from 0 to 10 percent throughout the profile, and the content of cobbles ranges from 0 to 3 percent.

The A horizon has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 1 or 2.

The Bg horizon has hue of 10YR to 5Y, value of 4 to 7, and chroma of 1 or 2. It is clay loam, silty clay loam, silty clay, or clay.

The C horizon has hue of 10YR to 5YR, value of 5 to 7, and chroma of 1 to 6.

Skeel Series

The Skeel series consists of very deep, moderately well drained soils that formed in sandy outwash over loamy lacustrine deposits. These soils are on lake plains. Permeability is moderately rapid in the upper part and slow in the lower part. Slopes range from 0 to 6 percent.

Typical pedon of Skeel loamy sand, 0 to 6 percent slopes, 300 feet south and 2,500 feet west of the northeast corner of sec. 28, T. 22 N., R. 7 E.; USGS Tawas City topographic quadrangle; lat. 44 degrees 16 minutes 41.99 seconds N. and long. 83 degrees 35 minutes 32.43 seconds W.; in Tawas Township:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) loamy sand, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; common medium and many fine roots; moderately acid; abrupt smooth boundary.

E—8 to 11 inches; light brownish gray (10YR 6/2) sand, white (10YR 8/1) dry; weak fine granular structure; very friable; few medium to coarse roots; moderately acid; abrupt broken boundary.

Bs1—11 to 18 inches; brown (7.5YR 4/4) sand; single grain; loose; few medium to coarse roots; ortstein occupies about 70 percent of the horizon and occurs as weakly and moderately cemented brown (10YR 5/3) and very dark brown (10YR 2/2) columns 3 to 5 inches wide; moderately acid; clear irregular boundary.

Bs2—18 to 29 inches; strong brown (7.5YR 5/6) sand; single grain; loose; few medium to coarse roots; ortstein occupies about 80 percent of the horizon and occurs as weakly and moderately cemented columns 3 to 5 inches wide; few fine distinct strong brown (7.5YR 5/8) masses of iron accumulation; few fine light gray (10YR 7/1) uncoated sand grains; moderately acid; clear wavy boundary.

Bs3—29 to 36 inches; yellowish brown (10YR 5/6) sand; single grain; loose; few medium and coarse roots; few medium prominent yellowish red (5YR 4/6) and common medium and fine distinct yellowish brown (10YR 5/8) masses of iron accumulation; strongly acid; abrupt smooth boundary.

2Bt—36 to 39 inches; reddish brown (5YR 4/4) clay loam; moderate medium subangular blocky structure; firm; very few faint reddish brown (5YR 4/3) clay films on faces of peds; common medium distinct yellowish red (7.5YR 4/6) masses of iron accumulation and common medium prominent grayish brown (2.5Y 5/2) iron depletions; about 3 percent gravel; neutral; clear wavy boundary.

2BC—39 to 45 inches; reddish brown (5YR 5/4) clay loam; moderate medium subangular blocky structure; firm; common medium distinct reddish brown (7.5YR 4/4) masses of iron accumulation and common medium and fine prominent greenish gray (5G 6/1) iron depletions; about 3 percent gravel; strongly effervescent; slightly alkaline; clear wavy boundary.

2C—45 to 80 inches; brown (7.5YR 5/4) clay loam; massive; firm; few prominent light gray (10YR 7/2) carbonate streaks; common medium distinct strong brown (7.5YR 5/6) masses of iron accumulation and few medium and fine prominent greenish gray (5G 6/1) iron depletions; about 3 percent gravel; strongly effervescent; moderately alkaline.

The depth to carbonates ranges from 24 to 60 inches. The thickness of the sandy sediments ranges from 20 to 40 inches. The content of ortstein ranges from 50 to 85 percent in the Bs horizon.

The Ap horizon has value of 2 or 3 and chroma of 1 to 3.

The E horizon has hue of 10YR or 7.5YR, value of 6 or 7, and chroma of 2 or 3. It is sand or loamy sand.

The Bs1 horizon has hue of 7.5YR or 5YR and value and chroma of 3 or 4. The content of ortstein ranges from 50 to 90 percent.

The Bs2 and Bs3 horizons have hue of 10YR to 5YR, value of 3 to 5, and chroma of 4 to 6. The content of ortstein ranges from 50 to 90 percent.

The 2Bt horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is clay loam or silty clay loam. The content of clay ranges from 27 to 40 percent.

The 2C horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 2 to 4. It is clay loam or silty clay loam.

Springport Series

The Springport series consists of poorly drained soils that formed in silty and clayey lacustrine deposits. These soils are on lake plains. Permeability is very slow. Slopes range from 0 to 2 percent.

Typical pedon of Springport silt loam, 100 feet north and 3,600 feet east of the southwest corner of sec. 1, T. 24 N., R. 8 E.; USGS Foote Site Village topographic quadrangle; lat. 44 degrees 29 minutes 50.60 seconds N. and long. 83 degrees 24 minutes 28.20 seconds W.; in Oscoda Township:

Ap—0 to 11 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; many fine and medium roots; moderately acid; abrupt smooth boundary.

Bg1—11 to 23 inches; grayish brown (2.5Y 5/2) silty clay; strong medium angular blocky structure; firm; few fine roots; common medium prominent strong brown (7.5YR 5/8) masses of iron accumulation; few fine black (N 2/0) magnesium concretions on faces of peds; 1 percent pebbles; slightly acid; clear wavy boundary.

Bg2—23 to 27 inches; grayish brown (2.5Y 5/2) silty clay; strong medium angular blocky structure; firm; common medium prominent brown (7.5YR 5/2) iron depletions and common medium prominent strong brown (7.5YR 5/8) masses of iron accumulation; 1 percent pebbles; strongly effervescent; neutral; clear wavy boundary.

C—27 to 80 inches; pinkish gray (5YR 6/2) silty clay; strong coarse angular blocky structure; common prominent greenish gray (5GY 6/1) carbonate coatings on vertical faces of peds; common medium prominent strong brown (7.5YR 4/6) masses of iron accumulation and common medium prominent gray (5Y 5/1) iron depletions; 1 percent pebbles; violently effervescent; slightly alkaline.

The depth to carbonates ranges from 7 to 15 inches. The content of gravel ranges from 0 to 1 percent.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2.

The Bg horizon has hue of 2.5Y or 10YR, value of 4

or 5, and chroma of 1 or 2. It is clay or silty clay.

Some pedons have a BC horizon. This horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is silty clay or silty clay loam.

The C horizon has value of 5 or 6 and chroma of 2 to 4. It is silty clay or silty clay loam or is stratified with these textures.

Sprinkler Series

The Sprinkler series consists of somewhat poorly drained soils that formed in loamy till. These soils are on ground moraines. Permeability is moderately slow. Slopes range from 0 to 3 percent.

Typical pedon of Sprinkler sandy loam, 0 to 3 percent slopes, 2,565 feet south and 2,565 feet west of the northeast corner of sec. 14, T. 25 N., R. 6 E.; USGS Glennie topographic quadrangle; lat. 44 degrees 33 minutes 39 seconds N. and long. 83 degrees 40 minutes 29 seconds W.; in Curtis Township, Alcona County:

A—0 to 5 inches; very dark gray (10YR 3/1) sandy loam, gray (10YR 5/1) dry; weak medium subangular blocky structure; friable; many fine and medium roots; about 2 percent gravel; strongly acid; abrupt smooth boundary.

E—5 to 13 inches; brown (10YR 5/3) sandy loam, very pale brown (10YR 7/3) dry; moderate medium subangular blocky structure; firm; common fine roots in worm channels; common fine vesicular pores; common fine distinct yellowish brown (10YR 5/6) and common fine prominent strong brown (7.5YR 4/6) masses of iron accumulation; about 2 percent gravel; strongly acid; clear wavy boundary.

(E/B)x—13 to 23 inches; about 70 percent brown (10YR 5/3) sandy loam (E), very pale brown (10YR 7/3) dry; surrounding peds of brown (7.5YR 5/4) loam (Bt); weak very thick platy structure; firm; few fine roots between peds; common fine prominent strong brown (7.5YR 5/6) masses of iron accumulation and common fine prominent grayish brown (10YR 5/2) iron depletions; many fine vesicular pores; about 2 percent gravel; slightly brittle; strongly acid; clear irregular boundary.

(B/E)x—23 to 28 inches; about 70 percent brown (7.5YR 5/4) loam (Bt); surrounded by brown (10YR 5/3) sandy loam (E), very pale brown (10YR 7/3) dry; weak very coarse prismatic structure parting to weak very thick platy; firm; few fine roots between peds; many fine vesicular pores; common fine prominent yellowish brown (10YR 5/6) masses of iron accumulation and prominent grayish brown (10YR 5/2) iron depletions; about 2 percent gravel; slightly brittle; strongly acid; clear wavy boundary.

Bt1—28 to 35 inches; dark brown (7.5YR 4/4) loam; weak very thick platy structure; firm; few fine roots between peds; many fine vesicular pores; common faint brown (7.5YR 5/4) clay films more than 1 mm thick in vertical cracks between peds; common medium prominent yellowish brown (10YR 5/6) masses of iron accumulation on faces of peds and few fine prominent grayish brown (10YR 5/2) iron depletions in clay films and near roots; about 5 percent gravel; strongly acid; clear wavy boundary.

Bt2—35 to 44 inches; brown (7.5YR 5/4) loam; weak very thick platy structure; firm; few patchy faint brown (7.5YR 5/4) clay films on faces of plates; few fine prominent gray (N 6/0) iron depletions and common fine distinct strong brown (7.5YR 5/6) masses of iron accumulation; about 5 percent gravel; slightly effervescent; moderately alkaline; clear wavy boundary.

C—44 to 80 inches; brown (7.5YR 5/3) loam; massive; friable; common fine distinct strong brown (7.5YR 5/6) masses of iron accumulation; about 5 percent gravel; slightly effervescent; moderately alkaline.

The depth to free carbonates ranges from 30 to 50 inches. The content of gravel ranges from 1 to 5 percent throughout the profile, and the content of cobbles ranges from 0 to 3 percent.

The A horizon has hue of 7.5YR or 10YR or is neutral in hue. It has chroma of 0 or 1.

The E horizon has hue of 2.5Y or 10YR and chroma of 2 or 3.

The E part of the (E/B)x and (B/E)x horizons has hue of 5YR to 10YR, value of 5 or 6, and chroma of 2 or 3. It is sandy loam. The (E/B)x and (B/E)x horizons are slightly brittle but do not qualify as fragipans.

The B part of the (E/B)x and (B/E)x horizons has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is loam or clay loam.

The Bt and C horizons have hue of 5YR or 7.5YR, value of 5 or 6, and chroma of 3 or 4. They are loam or clay loam.

Tacoda Series

The Tacoda series consists of somewhat poorly drained soils that formed in sandy outwash over lacustrine deposits. These soils are on lake plains. Permeability is rapid in the upper part and very slow in the lower part. Slopes range from 0 to 4 percent.

Typical pedon of Tacoda sand (fig. 22), 0 to 3 percent slopes, 2,200 feet south and 400 feet west of the northeast corner of sec. 9, T. 21 N., R. 6 E.; USGS National City topographic quadrangle; lat. 44 degrees 13 minutes 41.90 seconds N. and long. 83 degrees 42 minutes 15.38 seconds W.; in Sherman Township:

A—0 to 3 inches; black (10YR 2/1) sand, dark gray (10YR 4/1) dry; weak fine granular structure; very friable; extremely acid; abrupt smooth boundary.

E—3 to 15 inches; light gray (10YR 7/2) sand, white (10YR 8/2) dry; weak medium subangular blocky structure; very friable; common fine faint light brownish gray (10YR 6/2) iron depletions and common medium and fine distinct light yellowish brown (10YR 6/4) masses of iron accumulation; extremely acid; abrupt smooth boundary.

Bs—15 to 23 inches; dark brown (7.5YR 3/4) sand; moderate medium subangular blocky structure; friable; few medium prominent yellowish red (5YR 4/6) masses of iron accumulation; extremely acid; clear wavy boundary.

Bw—23 to 35 inches; very pale brown (10YR 7/4) and light yellowish brown (10YR 6/4) sand; single grain; loose; common medium prominent strong brown (7.5YR 5/6) masses of iron accumulation; extremely acid; clear wavy boundary.

BC—35 to 45 inches; brown (10YR 4/3) sand; single grain; loose; common medium distinct yellowish brown (10YR 5/6) masses of iron accumulation; neutral; abrupt smooth boundary.

2C1—45 to 60 inches; dark brown (7.5YR 4/2) silty clay; moderate medium and fine subangular blocky structure; firm; strongly effervescent; slightly alkaline; gradual wavy boundary.

2C2—60 to 80 inches; brown (7.5YR 5/2) silty clay; moderate fine subangular blocky structure; firm; common medium faint dark brown (7.5YR 4/2) masses of iron accumulation; strongly effervescent; slightly alkaline.

The depth to clayey material and to free carbonates ranges from 40 to 60 inches. The content of coarse fragments ranges from 0 to 10 percent throughout.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2.

The E horizon has hue of 10YR, value of 6 to 8, and chroma of 2 or 3.

The Bs horizon has value of 3 or 4. Some pedons have a Bs2 horizon, which has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 4 to 6. The content of ortstein ranges from 0 to 25 percent.

The Bw horizon has value of 6 or 7.

The BC horizon has hue of 10YR or 7.5YR, value of 4 to 7, and chroma of 3 to 6.

The 2C horizon has value of 4 or 5. It is silty clay or clay.

Tawas Series

The Tawas series consists of very poorly drained soils that formed in sapric material 16 to 51 inches thick over sandy deposits. These soils are in depressions on outwash plains, lake plains, lake terraces, and moraines. Permeability is moderately slow to moderately rapid in the organic material and rapid in the sandy material. Slopes range from 0 to 2 percent.

Typical pedon of Tawas muck, in an area of Tawas-Lupton mucks, 450 feet north and 2,500 feet west of the southeast corner of sec. 6, T. 21 N., R. 6 E.; USGS Whittemore topographic quadrangle; lat. 44 degrees 14 minutes 2.97 seconds N. and long. 83 degrees 45 minutes 11.63 seconds W.; in Sherman Township:

Oa1—0 to 12 inches; muck (sapric material), black (N 2/0) broken face and rubbed; 25 percent fiber, 5 percent rubbed; weak fine and medium subangular blocky structure; very friable; slightly acid; clear smooth boundary.

Oa2—12 to 24 inches; muck (sapric material), black (N 2/0) broken face and rubbed; 30 percent fiber, 15 percent rubbed; moderate medium subangular blocky structure parting to moderate thin platy; very friable; slightly acid; clear smooth boundary.

C—24 to 80 inches; light brownish gray (10YR 6/2) sand; single grain; loose; slightly effervescent; neutral.

The depth to sandy mineral layers ranges from 16 to 50 inches.

The organic layers are primarily woody material. They have hue of 5YR to 10YR or are neutral in hue. They have value of 2 or 3 and chroma of 0 or 1. The organic layers are typically sapric material, but the range includes thin layers of hemic material. The total thickness of the hemic layers is less than 10 inches.

The Cg horizon has value of 3 to 6 and chroma of 1 to 3. It is sand or fine sand.

Tonkey Series

The Tonkey series consists of poorly drained soils that formed in stratified loamy and sandy lacustrine deposits. These soils are on till plains and outwash plains. Permeability is moderate. Slopes range from 0 to 2 percent.

The Tonkey soils in this survey area have a thicker surface layer than is defined as the range for the

series. These soils are classified as coarse-loamy, mixed Aquic Haploborolls.

Typical pedon of Tonkey sandy loam, 2,000 feet north and 100 feet west of the southeast corner of sec. 24, T. 23 N., R. 4 E.; USGS Sage Lake topographic quadrangle; lat. 44 degrees 22 minutes 8 seconds N. and long. 83 degrees 53 minutes 5 seconds W.; in Hill Township, Ogemaw County:

A—0 to 7 inches; black (10YR 2/1) sandy loam, very dark gray (10YR 3/1) dry; moderate fine granular structure; friable; many fine and medium roots; neutral; abrupt wavy boundary.

Bg1—7 to 9 inches; grayish brown (10YR 5/2) loamy sand; weak medium subangular blocky structure; very friable; many fine and common medium roots; neutral; clear wavy boundary.

Bg2—9 to 12 inches; light brownish gray (2.5Y 6/2) sandy loam; weak medium subangular blocky structure; very friable; many fine and common medium roots; common medium prominent brownish yellow (10YR 6/8) masses of iron accumulation; common prominent very dark gray (10YR 3/1) organic stains; neutral; clear wavy boundary.

Bw—12 to 17 inches; light yellowish brown (10YR 6/4) sandy clay loam; massive; firm; many fine and common medium roots; common medium prominent strong brown (7.5YR 5/6) masses of iron accumulation; few prominent very dark gray (10YR 3/1) organic stains; neutral; abrupt wavy boundary.

C—17 to 80 inches; light yellowish brown (10YR 6/4), pale brown (10YR 6/3), light brownish gray (10YR 6/2), and gray (10YR 6/1), stratified fine sand, very fine sand, loam, and silt loam; massive; friable; common medium prominent strong brown (7.5YR 5/6) and common fine distinct brownish yellow (10YR 6/6) masses of iron accumulation; strongly effervescent; moderately alkaline.

The depth to calcium carbonates ranges from 16 to 30 inches. The content of gravel ranges from 0 to 5 percent in the solum.

The A horizon has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 1 or 2.

The Bg horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 5 or 6, and chroma of 1 or 2. It is sandy loam or loamy sand.

The Bw horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 4. It is sandy clay loam or loam.

The C horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 1 to 4. It is stratified with textures ranging from sand to silt loam. Textures are variable within short horizontal distances. In some pedons the C horizon has lenses of gravel.

Typic Duraquods

The Typic Duraquods consist of somewhat poorly drained soils that formed in sandy outwash. These soils are on outwash plains and lake plains. They contain ortstein. Permeability is moderate in the ortstein and rapid in the rest of the profile. Slopes range from 0 to 3 percent.

Reference pedon of Typic Duraquods, sandy, nearly level, 800 feet north and 2,640 feet west of the southeast corner of sec. 11, T. 23 N., R. 8 E.; USGS Foote Site Village topographic quadrangle; lat. 44 degrees 23 minutes 39 seconds N. and long. 83 degrees 25 minutes 16 seconds W.; in Wilber Township:

Oa—0 to 2 inches; black (5YR 2/1), well decomposed leaf litter; clear smooth boundary.

E—2 to 10 inches; grayish brown (10YR 6/1) sand, light brownish gray (10YR 6/2)) dry; single grain; loose; common medium faint light gray (10YR 6/1) iron depletions; very strongly acid; clear wavy boundary.

Bhsm—10 to 15 inches; dark reddish brown (5YR 3/2) sand; massive and strong subangular blocky structure; very firm; common fine prominent brown (10YR 5/3) iron depletions; ortstein occupies 100 percent of the horizon; strongly acid; clear wavy boundary.

Bsm—15 to 27 inches; dark reddish brown (7.5YR 3/4) sand; massive and strong thick platy structure; very firm; common medium prominent pale brown (10YR 6/3) iron depletions and common medium faint dark reddish brown (7.5YR 3/3) masses of iron accumulation; ortstein occupies 100 percent of the horizon; strongly acid; clear wavy boundary.

BC—27 to 50 inches; yellowish brown (10YR 5/6) sand; single grain; loose; few medium distinct brown (7.5YR 4/4) and few fine distinct pale brown (10YR 6/3) masses of iron accumulation; moderately acid; clear wavy boundary.

C—50 to 80 inches; brown (10YR 4/3) sand; single grain; loose; neutral.

The depth to the C horizon ranges from 25 to 35 inches. The content of gravel ranges from 0 to 5 percent.

The A horizon, if it occurs, has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 1 or 2. The A and E horizons are sand or loamy sand.

The Bhsm horizon has hue of 5YR or 7.5YR, value of 2 or 3, and chroma of 1 to 3. More than half of the horizon is cemented.

The BC horizon has hue of 5YR to 10YR, value of 3 to 5, and chroma of 4 to 6.

The C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4.

Typic Endoaquods

The taxonomic classification of these soils is mixed, frigid Typic Endoaquods. The soils are very poorly drained and are on lake plains and outwash plains. They formed in sandy lacustrine deposits or outwash material. Permeability is rapid. Slopes range from 0 to 2 percent.

Reference pedon of Typic Endoaquods, wet, nearly level, 300 feet west of the southeast corner of sec. 24, T. 26 N., R. 7 E.; USGS Barton City topographic quadrangle; lat. 44 degrees 37 minutes 39 seconds N. and long. 83 degrees 31 minutes 30 seconds W.; in Alcona County:

Oa—0 to 2 inches; black (10YR 2/1) muck; many fine and very fine roots; strongly acid; abrupt smooth boundary.

A—2 to 4 inches; black (10YR 2/1) mucky sand, dark gray (10YR 4/2) dry; weak medium granular structure; very friable; common fine and medium roots; strongly acid; clear smooth boundary.

E—4 to 7 inches; grayish brown (10YR 5/2) sand, light brownish gray (10YR 6/2) dry; weak medium granular structure; very friable; common fine and medium roots; few fine distinct yellowish red (5YR 5/6) masses of iron accumulation; strongly acid; abrupt irregular boundary.

Bs1—7 to 10 inches; dark brown (7.5YR 4/4) sand; moderate medium subangular blocky structure; friable; common fine prominent yellowish red (5YR 5/6) masses of iron accumulation; strongly acid; clear wavy boundary.

Bs2—10 to 17 inches; strong brown (7.5YR 5/6) sand; weak medium subangular blocky structure; very friable; strongly acid; clear wavy boundary.

C—17 to 80 inches; brown (10YR 5/3) sand; single grain; loose; many medium distinct yellowish red (5YR 5/8) masses of iron accumulation; strongly acid.

An organic surface layer, 3 to 5 inches thick, is typically on the surface. This layer is dominantly muck or mucky peat. It has hue of 5YR to 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2.

The E horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 1 or 2. It is sand, loamy sand, or fine sand.

The Bs horizon has hue of 5YR to 10YR, value of 2 or 3, and chroma of 4 to 6. It is sand, loamy sand, or fine sandy loam.

The C horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 to 8. It is sand, loamy sand, or fine sand.

Typic Udipsamments

The taxonomic classification of these soils is mixed, frigid Typic Udipsamments. The soils are moderately well drained and excessively drained and are on outwash plains, stream terraces, deltas, and moraines. They formed in sandy material. Permeability is rapid. Slopes range from 0 to 50 percent.

Reference pedon of Typic Udipsamments, nearly level and undulating, 2,620 feet north and 20 feet east of the southwest corner of sec. 4, T. 26 N., R. 5 E.; USGS Curran topographic quadrangle; lat. 44 degrees 40 minutes 30 seconds N. and long. 83 degrees 50 minutes 49 seconds W.; in Alcona County:

Oi—1 inch to 0; undecomposed hardwood and coniferous leaf litter.

A—0 to 2 inches; very dark gray (10YR 3/1) sand, dark grayish brown (10YR 4/2) dry; weak medium granular structure; very friable; many very fine and fine roots; strongly acid; abrupt wavy boundary.

E—2 to 4 inches; light brownish gray (10YR 6/2) sand, light gray (10YR 7/2) dry; weak medium subangular blocky structure; very friable; strongly acid; abrupt wavy boundary.

Bw—4 to 22 inches; dark yellowish brown (10YR 4/4) sand; weak coarse subangular blocky structure; very friable; strongly acid; clear wavy boundary.

BC—22 to 40 inches; yellowish brown (10YR 5/6) sand; single grain; loose; strongly acid; gradual wavy boundary.

C—40 to 180 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; strongly acid.

The thickness of the solum ranges from 20 to 40 inches. The content of gravel ranges from 0 to 10 percent throughout the profile.

The A horizon has hue of 10YR, value of 2 to 4, and chroma of 1 to 3.

The E horizon has hue of 10YR, value of 4 to 6, and chroma of 2 or 3. It is sand or loamy sand. Some pedons do not have an E horizon.

The Bw horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is sand or loamy sand.

The C horizon has hue of 10YR or 7.5YR, value of 6 or 7, and chroma of 4 to 6. It is sand or coarse sand.

Loamy sand, coarse loamy sand, and gravelly loamy sand may occur at a depth of more than 60 inches. The banded substratum phases have thin bands of loamy sand or sandy loam below a depth of 60 inches. The loamy substratum phases have sandy loam to sandy clay loam below a depth of 40 inches. A seasonal high water table is below a depth of 40 inches in some pedons.

Udipsamments

The Udipsamments consist of excessively drained to moderately well drained soils that formed in sandy outwash and lacustrine deposits. These soils are on outwash plains, deltas, stream terraces, and lake plains. Permeability is rapid. Slopes range from 0 to 8 percent.

Typical pedon of Udipsamments, nearly level and undulating, 900 feet south and 1,320 feet west of the northeast corner of sec. 4, T. 24 N., R. 9 E.; USGS Greenbush topographic quadrangle; lat. 44 degrees 30 minutes 39 seconds N. and long. 83 degrees 20 minutes 46 seconds W.; in Oscoda Township:

Ap—0 to 5 inches; very dark grayish brown (10YR 3/2) loamy sand, dark gray (10YR 4/1) dry; weak fine granular structure; very friable; about 1 percent gravel; moderately acid; abrupt smooth boundary.

Bw—5 to 32 inches; yellowish brown (10YR 5/6) sand; single grain; loose; about 1 percent gravel; strongly acid; clear wavy boundary.

C—32 to 80 inches; pale brown (10YR 6/3) sand; single grain; loose; about 1 percent gravel; slightly acid.

The content of gravel ranges from 0 to 5 percent throughout.

The Ap horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. It is loamy sand or sand. Some pedons do not have an Ap horizon.

The Bw horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 8. In some pedons this horizon has lamellae in the lower part.

The C horizon has hue of 10YR, value of 5 to 7, and chroma of 3 or 4. It is sand, loamy sand, or stratified sand and coarse sand. In some pedons the C horizon has redoximorphic features.

Udorthents

The Udorthents consist of well drained and moderately well drained soils that formed in loamy and lacustrine deposits and till deposits. These soils are on till plains, moraines, and lake plains. Permeability is moderately slow. Slopes range from 0 to 50 percent.

Typical pedon of Udorthents, loamy, very steep, 75 feet north and 2,400 feet west of the southeast corner of sec. 27, T. 21 N., R. 7 E.; USGS Alabaster topographic quadrangle; lat. 44 degrees 10 minutes 40 seconds N. and long. 83 degrees 34 minutes 13 seconds W.; in Alabaster Township:

A—0 to 12 inches; very dark grayish brown (10YR 3/2) silty clay loam, light gray (10YR 6/1) dry; moderate medium subangular blocky structure; friable; about 10 percent fragments of gypsum; slightly effervescent; slightly alkaline; abrupt smooth boundary.

C1—12 to 45 inches; dark brown (10YR 4/3) silty clay loam; moderate medium subangular blocky structure; friable; about 10 percent fragments of gypsum; strongly effervescent; moderately alkaline; clear wavy boundary.

C2—45 to 80 inches; strong brown (7.5YR 4/6) silty clay loam; massive; firm; about 10 percent fragments of gypsum; violently effervescent; strongly alkaline.

The content of gravel ranges from 0 to 15 percent throughout.

The A horizon has hue of 10YR or 7.5YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. It is silty clay loam, silty clay, loam, clay loam, or sandy loam. Some pedons do not have an A horizon.

The C horizon has hue of 10YR or 7.5YR, value of 3 to 6, and chroma of 3 or 4. It is silty clay loam, silty clay, clay, loam, clay loam, or sandy clay loam. In some pedons the C horizon has redoximorphic features.

Wabun Series

The Wabun series consists of very poorly drained soils that formed in sandy outwash underlain by clayey lacustrine deposits. These soils are on lake plains. Permeability is rapid in the upper part and slow in the lower part. Slopes range from 0 to 2 percent.

Typical pedon of Wabun mucky sand, 2,200 feet north and 700 feet west of the southeast corner of sec. 13, T. 21 N., R. 6 E.; USGS National City topographic quadrangle; lat. 44 degrees 12 minutes 43 seconds N. and long. 83 degrees 38 minutes 43 seconds W.; in Sherman Township:

A—0 to 6 inches; black (10YR 2/1) mucky sand, very dark gray (10YR 3/1) dry; weak fine granular structure; very friable; many fine and medium roots; moderately acid; abrupt smooth boundary.

Cg1—6 to 10 inches; gray (10YR 5/1) sand; weak fine granular structure; very friable; many fine and medium roots; strongly acid; clear wavy boundary.

Cg2—10 to 30 inches; light brownish gray (10YR 6/2) sand; single grain; loose; many fine and medium roots; common medium prominent yellowish brown (10YR 5/6) masses of iron accumulation and common medium faint gray (10YR 6/1) iron depletions; moderately acid; clear wavy boundary.

Cg3—30 to 48 inches; dark grayish brown (10YR 4/2) sand; single grain; loose; many medium and coarse distinct dark yellowish brown (10YR 4/6) masses of iron accumulation; moderately acid; clear wavy boundary.

Cg4—48 to 58 inches; grayish brown (10YR 5/2), stratified sand and fine sand; single grain; loose; neutral; clear wavy boundary.

2Cg5—58 to 80 inches; gray (10YR 5/1) silty clay; massive; firm; strongly effervescent; moderately alkaline.

The thickness of the upper sandy layers and the depth to free carbonates range from 40 to 60 inches. The content of gravel ranges from 0 to 3 percent throughout the profile.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1.

The Cg horizon has hue of 10YR or 7.5YR, value of 4 to 7, and chroma of 1 to 3. It is sand or fine sand or is stratified with these textures.

The 2Cg horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 1 to 3. It is silty clay or clay.

Wakeley Series

The Wakeley series consists of very poorly drained soils that formed in sandy outwash underlain by clayey lacustrine deposits. These soils are on lake plains. Permeability is rapid in the sandy part and very slow in the clayey part. Slopes range from 0 to 2 percent.

Typical pedon of Wakeley muck, in an area of McIvor-Wakeley complex, 0 to 3 percent slopes, 100 feet north and 650 feet east of the southwest corner of sec. 36, T. 22 N., R. 6 E.; USGS National City topographic quadrangle; lat. 44 degrees 14 minutes 58.76 seconds N. and long. 83 degrees 39 minutes 44.55 seconds W.; in Grant Township:

Oa—0 to 5 inches; black (10YR 2/1) muck; moderate medium granular structure; very friable; many fine to coarse roots; very strongly acid; clear smooth boundary.

Cg1—5 to 8 inches; dark grayish brown (2.5Y 4/2) sand; single grain; loose; common fine roots; common medium prominent yellowish brown (10YR 5/6) and strong brown (7.5YR 4/6) masses of iron accumulation; strongly alkaline; gradual wavy boundary.

Cg2—8 to 16 inches; grayish brown (10YR 5/2) sand; single grain; loose; common fine roots; few fine distinct light gray (10YR 7/2) iron depletions; strongly alkaline; gradual wavy boundary.

C1—16 to 27 inches; brown (10YR 5/3) sand; weak medium and fine subangular blocky structure; very friable; common fine roots; few medium prominent yellowish red (5YR 5/6) masses of iron accumulation; moderately alkaline; abrupt wavy boundary.

2C2—27 to 35 inches; reddish brown (5YR 5/3) clay; moderate medium angular blocky structure; firm; few medium prominent strong brown (7.5YR 4/6) masses of iron accumulation and few medium prominent greenish gray (5G 6/1) iron depletions; slightly effervescent; neutral; gradual wavy boundary.

2C3—35 to 80 inches; pinkish gray (7.5YR 6/2) clay; massive; firm; common coarse prominent strong brown (7.5YR 5/6) masses of iron accumulation and few medium prominent greenish gray (5G 5/1) iron depletions; violently effervescent; slightly alkaline.

The thickness of the upper sandy layers ranges from 20 to 40 inches. The content of gravel ranges from 0 to 3 percent throughout the profile.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. It is muck or mucky sand.

The Cg and C horizons have hue of 2.5Y to 7.5YR, value of 4 to 6, and chroma of 2 or 3.

The 2C horizon has hue of 5YR or 7.5YR or is neutral in hue. It has value of 5 or 6 and chroma of 0 to 3. It is silty clay or silty clay loam. In some pedons it has thin layers of coarse sand about 1/4 inch thick.

Whittemore Series

The Whittemore series consists of somewhat poorly drained soils that formed in sandy outwash over clayey lacustrine material. These soils are on lake plains. They contain ortstein. Permeability is moderate in the ortstein and very slow in the underlying clayey material. Slopes range from 0 to 6 percent.

Typical pedon of Whittemore sand (fig. 23), in an area of Whittemore-Springport complex, 0 to 3 percent slopes, 550 feet south and 900 feet east of the northwest corner of sec. 36, T. 22 N., R. 6 E.; USGS Floyd Lake topographic quadrangle; lat. 44 degrees 15 minutes 44.89 seconds N. and long. 83 degrees 39 minutes 39.25 seconds W.; in Grant Township:

Ap—0 to 9 inches; very dark gray (10YR 3/1) sand, gray (10YR 6/1) dry; weak fine granular structure; very friable; very strongly acid; abrupt smooth boundary.

E—9 to 12 inches; light grayish brown (10YR 6/2) and light gray (10YR 7/2) sand, light gray (10YR 7/1) and white (10YR 8/1) dry; single grain; loose; pockets of very dark gray (10YR 3/1) material from the Ap horizon and black (N 2/0) burned roots; very strongly acid; abrupt smooth boundary.

Bhsm—12 to 17 inches; dark reddish brown (5YR 2/2 and 3/3) sand; strong medium and thick platy structure; firm; strongly cemented ortstein occurs as a nearly continuous layer and occupies more than 90 percent of the horizon; few fine prominent light brownish gray (10YR 6/2) iron depletions; strongly acid; abrupt smooth boundary.

Bw1—17 to 23 inches; yellowish brown (10YR 5/6) sand; single grain; loose; many coarse prominent yellowish red (5YR 4/6) and common medium distinct light yellowish brown (10YR 6/4) masses of iron accumulation and few fine prominent grayish brown (2.5Y 5/2) iron depletions; strongly acid; clear wavy boundary.

Bw2—23 to 29 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; few fine distinct brownish yellow (10YR 6/6) masses of iron accumulation; moderately acid; abrupt wavy boundary.

Bw3—29 to 35 inches; yellowish brown (10YR 5/4) loamy sand; single grain; loose; thin strata (1/8 to 1/4 inch thick) of brown (10YR 5/3) silt; common fine prominent strong brown (7.5YR 5/6) masses of iron accumulation; slightly acid; clear wavy boundary.

2Bt—35 to 44 inches; light reddish brown (5YR 6/3) silty clay; strong coarse angular blocky structure parting to strong medium and fine angular blocky; firm; common discontinuous distinct yellowish brown (10YR 5/4) clay flows; many medium yellowish red (7.5YR 5/6) masses of iron accumulation and many fine and medium prominent greenish gray (5GY 6/1) iron depletions; about 1 percent coarse fragments; strongly effervescent; slightly alkaline; gradual wavy boundary.

2C—44 to 80 inches; reddish brown (5YR 5/3) silty clay; massive with widely spread vertical fractures; firm; few fine white (10YR 8/1) carbonate coatings on vertical faces of peds; common coarse prominent light olive brown (2.5Y 5/6) masses of iron accumulation and many medium prominent gray (N 6/0) iron depletions; about 1 percent coarse fragments; violently effervescent; slightly alkaline.

The thickness of the sandy material ranges from 20 to 40 inches.

The Ap horizon has hue of 10YR or is neutral in hue. It has chroma of 0 or 1. The E horizon has value of 6 or 7.

The Bhsm horizon has hue of 7.5YR or 5YR and value and chroma of 2 or 3. About 90 percent or more of the horizon is cemented. Cementation ranges from weak to strong.

Some pedons have a Bsm horizon, which has hue of 5YR to 10YR, value of 2 to 5, and chroma of 2 to 6. More than 90 percent of the horizon is cemented. Some pedons have a Bs horizon. This horizon, if it occurs, has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 to 8.

The Bw horizon has hue of 10YR, 7.5YR, or 5YR, value of 5 or 6, and chroma of 4 to 6. It is loamy sand or sand.

The 2Bt horizon has value of 3 to 6 and chroma of 3 or 4. It is silty clay or clay. The content of clay ranges from 40 to 60 percent.

The 2C horizon has hue of 7.5YR or 5YR. The content of clay ranges from 40 to 60 percent.

Winterfield Series

The Winterfield series consists of somewhat poorly drained soils that formed in sandy alluvium. These soils are on flood plains. Permeability is rapid. Slopes range from 0 to 2 percent.

Typical pedon of Winterfield loamy sand, rarely flooded, 0 to 2 percent slopes, 1,350 feet north and 2,480 feet east of the southwest corner of sec. 33, T. 21 N., R. 6 E.; USGS National City topographic quadrangle; lat. 44 degrees 09 minutes 58.92 seconds N. and long. 83 degrees 42 minutes 46.98 seconds W.; in Sherman Township:

A—0 to 8 inches; very dark brown (10YR 2/2) loamy sand, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; many fine to coarse roots; less than 5 percent coarse fragments; very strongly acid; abrupt smooth boundary.

C1—8 to 18 inches; brown (10YR 5/3) loamy sand; weak medium subangular blocky structure; very friable; many fine to coarse roots; few medium faint light brownish gray (10YR 6/2) iron depletions and few medium distinct yellowish brown (10YR 5/6) masses of iron accumulation in the lower part of the horizon; less than 5 percent coarse fragments; very strongly acid; clear wavy boundary.

C2—18 to 45 inches; brown (10YR 5/3) sand; weak medium subangular blocky structure; very friable; many fine to coarse roots in the upper part; few medium faint light brownish gray (10YR 6/2) iron depletions and few medium distinct yellowish brown (10YR 5/6) masses of iron accumulation; few very dark gray (10YR 3/1) organic bands less than 1 inch thick; less than 5 percent coarse fragments; very strongly acid; clear wavy boundary.

C3—45 to 80 inches; grayish brown (10YR 5/2) sand with few strata of fine sand; single grain; loose; few medium faint light brownish gray (10YR 6/2) iron depletions and common medium distinct yellowish brown (10YR 5/6) and dark yellowish brown (10YR 4/6) masses of iron accumulation; few very dark gray (10YR 3/1) organic bands less than 1 inch thick; very strongly acid.

The control section has variable textures within short horizontal distances. It is sand, fine sand, loamy sand, loamy fine sand, or coarse sand. There is an irregular decrease in carbon with increasing depth.

The A horizon has hue of 10YR or 7.5YR, value of 2 to 4, and chroma of 1 to 3.

The C horizon has hue of 5YR to 2.5Y or is neutral in hue. It has value of 2 to 6 and chroma of 0 to 6.

Wurtsmith Series

The Wurtsmith series consists of moderately well drained soils that formed in sandy outwash. These soils are on outwash plains, beach ridges, dunes, lake plains, and river terraces. Permeability is rapid. Slopes range from 0 to 12 percent.

Typical pedon of Wurtsmith sand, 0 to 6 percent slopes, 400 feet north and 1,300 feet east of the southwest corner of sec. 11, T. 24 N., R. 8 E.; USGS East Tawas topographic quadrangle; lat. 44 degrees 18 minutes 28.04 seconds N. and long. 83 degrees 26 minutes 13.60 seconds W.; in Baldwin Township:

Oe—0 to 1 inch; black (N 2/0), partially decomposed leaf litter; extremely acid.

E—1 to 4 inches; grayish brown (10YR 5/2) sand, dry; weak fine subangular blocky structure; very friable; many fine and medium roots; extremely acid; clear wavy boundary.

Bs—4 to 14 inches; yellowish brown (10YR 5/8) sand; weak medium subangular blocky structure; very friable; common medium and fine roots; extremely acid; clear wavy boundary.

BC—14 to 24 inches; brownish yellow (10YR 6/6) sand; weak fine subangular blocky structure; very friable; common fine light gray (10YR 7/2) uncoated sand grains; extremely acid; clear wavy boundary.

C1—24 to 48 inches; pale brown (10YR 6/3) sand; weak coarse subangular blocky structure; very friable; common fine light gray (10YR 7/2) uncoated sand grains; common medium distinct yellowish brown (10YR 5/6) masses of iron accumulation; extremely acid; clear wavy boundary.

C2—48 to 80 inches; brown (10YR 5/3) sand; single grain; loose; common medium distinct yellowish brown (10YR 5/6) masses of iron accumulation; extremely acid.

The depth to redoximorphic features ranges from 20 to 40 inches. The content of coarse fragments ranges from 0 to 15 percent throughout the profile.

Some pedons have an A horizon. This horizon has hue of 10YR or is neutral in hue. It has value of 2 to 4 and chroma of 0 to 2.

The Bw horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 8.

The BC horizon has value of 5 or 6 and chroma of 4 to 6.

The C horizon has value of 5 or 6 and chroma of 2 to 4.

Zimmerman Series

The Zimmerman series consists of excessively drained soils that formed in sandy deposits. These soils are on deltas. Permeability is rapid. Slopes range from 0 to 6 percent.

Typical pedon of Zimmerman loamy fine sand, in an area of Zimmerman-Alcona complex, 6 to 18 percent slopes, 500 feet north and 170 feet west of the southeast corner of sec. 9, T. 25 N., R. 9 E.; USGS Greenbush topographic quadrangle; lat. 44 degrees 34 minutes 14 seconds N. and long. 83 degrees 20 minutes 32 seconds W.; in Greenbush Township, Alcona County:

A—0 to 2 inches; black (N 2/0) loamy fine sand, dark gray (N 4/0) dry; weak medium granular structure; friable; many fine and common medium roots; moderately acid; abrupt smooth boundary.

E—2 to 4 inches; grayish brown (10YR 5/2) loamy fine sand, light brownish gray (10YR 6/2) dry; weak medium subangular blocky structure; very friable; many fine and common medium roots; moderately acid; abrupt smooth boundary.

Bw1—4 to 7 inches; strong brown (7.5YR 4/6) loamy fine sand; weak medium subangular blocky

structure; very friable; many fine and common medium roots; about 1 percent gravel; moderately acid; clear wavy boundary.

Bw2—7 to 24 inches; yellowish brown (10YR 5/6) loamy fine sand; weak medium subangular blocky structure; very friable; few fine roots; slightly acid; clear wavy boundary.

E&Bt—24 to 80 inches; yellowish brown (10YR 5/4) fine sand (E), very pale brown (10YR 7/3) dry; weak medium platy structure; very friable; lamellae of strong brown (7.5YR 4/6) loamy fine sand (Bt) 1/4 inch thick with a total accumulation of 2.5 inches; neutral.

The depth to free carbonates ranges from 60 to more than 80 inches. The content of gravel ranges from 0 to 3 percent throughout the profile.

The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2.

The E horizon and the E part of the E&Bt horizon have value of 5 to 7 and chroma of 2 to 4. The texture is fine sand or loamy fine sand.

The Bw horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6.

The Bt part of the E&Bt horizon consists of one or more thin lamellae that begin at a depth of 24 to 60 inches and range from 1/2 inch to less than 6 inches in combined thickness. The lamellae have value of 4 or 5 and chroma of 3 to 6. They are loamy fine sand or fine sandy loam.

Formation of the Soils

This section relates the factors of soil formation to the soils in Iosco County and describes the processes of soil formation.

Factors of Soil Formation

Soil formation is the natural development of horizons in a profile. Soil forms through the interaction of five major factors: the physical, chemical, and mineralogical composition of the parent material; the climate under which the soil material has accumulated and existed since accumulation; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time that the processes of soil formation have acted on the parent material (Donahue and others, 1977). Human activities also affect soil formation.

Climate and plant and animal life are the active forces of soil formation. They slowly change the parent material into a natural body of soil that has genetically related layers, called horizons. The effects of climate and plant and animal life are conditioned by relief. The nature of the parent material affects the kind of soil profile that forms; in extreme cases, it determines the soil profile entirely. Finally, time is needed for changing the parent material into a soil. Some time is always needed for the differentiation of soil horizons. Many of the processes of soil development are unknown.

Parent Material

Parent material is the mass in which a soil forms. It is derived from rocks that have been disintegrated by the abrasive action caused by particles moving against each other in flowing water, by moving ice (glaciers), by wind, by freezing and thawing, and by downslope movement. The small, loose rock particles that accumulate from the grinding become parent material (Evenson and others, 1976). The parent materials of the soils in Iosco County were deposited by glaciers, by glacial meltwater, or by wind (Farrand and Eschman, 1974). The glaciers covered the county 9,000 to 10,500 years ago. Some of these glacial materials have been reworked and redeposited by the subsequent action of wind and water. Although the parent materials are of a common glacial origin, their properties vary greatly, sometimes within small areas, depending on how the materials were deposited. The dominant parent materials in Iosco County were deposited as glacial till, outwash, lacustrine sediments, alluvium, eolian material, or organic material. The bedrock beneath these materials is generally at a depth of 50 to 200 feet, but in several areas bedrock is exposed at the surface. The bedrock has had little or no influence on the soils.

Glacial till was deposited directly by the glaciers with a minimum of water action. It is a mixture of particles of different sizes. The glacial till in Iosco County is calcareous clay loam and clay. Nester and Kent soils are examples of soils that formed in glacial till. They typically are fine textured and have a well developed subsoil. In some areas layers of sand are found below the depth of soil formation (Farrand and Eschman, 1974).

Outwash material was deposited by running water from melting glaciers. The size of the particles varies according to the speed of the stream that carried them. As the speed of the stream decreased, the coarser particles were deposited. Only the finer particles, such as very fine sand, silt, and clay, can be carried by slowly moving water. Outwash deposits generally occur as layers of particles of similar size, such as sand or gravel. Grayling and Coppler soils formed in deposits of outwash.

Lacustrine material was deposited near the shore line of glacial lakes that encroached inland as the glacier retreated toward the end of the last ice age (Leverett, 1917). Many areas of Iosco County are sandy lake plains that formed as sand dropped out in the coastal waters. Many of these sandy lake plains were shallow water areas that were influenced by wave action. The fine textured lacustrine material was deposited in deep water where clay and silts settled out. Many of the clayey lacustrine areas have been covered by sandy materials at various depths. In Iosco County the soils that formed in lacustrine deposits typically are in areas east of the East Branch Au Gres River. Wurtsmith and Meehan soils are examples of soils that formed in sandy lacustrine areas, Manary and Iargo soils are examples of soils that formed in

clayey lacustrine areas, and McIvor and Whittemore soils are examples of soils that formed in sandy over clayey lacustrine deposits.

Alluvium is material recently deposited by floodwater from streams. This material varies in texture, depending on the speed of the water from which it was deposited. Colonville and Evart soils formed in alluvium.

Eolian material has been transported and deposited by the wind. Numerous areas of Iosco County have windblown deposits. Good examples of low dunes are in Alabaster Township. These long and narrow areas of Crowell and Proper soils are examples of soils that formed on dunes in eolian material.

Organic material occurs as deposits of plant remains. After the glaciers receded, water was left standing in depressions on outwash plains, flood plains, moraines, and till plains. Because of the wetness, the remains of shrubs, grasses, sedges, and water-tolerant plants that grew around the edges of these depressions did not decompose quickly. Eventually, the plant residue filled the depressions and decomposed to form muck. Lupton and Tawas soils formed in organic material.

Climate

Climate is a dominant factor in soil formation. Climate influences soil formation mainly through precipitation and temperature. A soil is said to be well developed when it has detectable layers of accumulated organic matter, translocated clays, sesquioxides, carbonates, or soluble salts that have been moved downward by water. The extent of colloidal movement and the depth of deposition are determined partly by the amount and pattern of precipitation, which produces the leaching. Through its influence on soil temperature, climate also determines the rate of chemical reaction in the soil.

The climate in Iosco County is cool and humid. In areas adjacent to Lake Huron, the date of the first frost in fall is later than in other parts of the county. Also, the date of the last frost in spring is earlier, and spring daytime temperatures are generally cooler. These characteristics are the result of the lake warming up slowly in the spring and cooling slowly in the fall.

Plant and Animal Life

The activity of plants and animals and the decomposition of their organic residues and wastes (the biosphere) have marked effects on soil development. The well drained soils in Iosco County formed under forest vegetation, which produces a light colored, leached subsurface horizon underlain by a zone of accumulation. Organic soils, such as Lupton and Tawas soils, formed in the decayed remains of plants accumulated in depressions. The roots of the plants provided channels for the downward movement of water through the soil and added organic matter as they decayed. Micro-organisms in the soil help to break down the organic matter into plant nutrients.

Differences in natural drainage and minor variations in parent material affected the composition of the forest species. The moderately well drained soils, such as Nester, Kent, Morganlake, and Negwegon soils, were mainly covered by sugar maple, beech, and oak. The somewhat poorly drained and poorly drained soils, including Ingalls, Au Gres, and Springport soils, were covered by aspen, ash, and soft maples.

Relief

Relief affects the natural drainage of soils, the rate of erosion, the kind of plant cover, and soil temperature. Although slopes range from 0 to 75 percent in Iosco County, for the most part the county is relatively flat. Most slopes occur as dissections of the landscape by rivers and streams. Runoff is most rapid on the steeper slopes. In low areas, water is temporarily ponded.

The soils in the county range from excessively drained on hilltops and ridgetops to very poorly drained in depressions. Through its effect on soil aeration, drainage partly determines the color of the soil. Water and air move freely through well drained soils and slowly through very poorly drained soils. In Rubicon and other well aerated soils, the iron and aluminum compounds are brightly colored and oxidized. Sims and other poorly aerated soils are dull gray and mottled.

Time

The length of time necessary for a soil to develop distinct layers, or horizons, depends upon many interrelated factors, such as climate, type of parent material, and relief.

The glacial deposits in which many of the soils formed have been exposed to the soil-forming factors long enough for the development of distinct horizons. The soils that formed in recent alluvial sediments, however, have not been in place long enough for the development of distinct soil horizons. Colonville soils are examples of young alluvial soils. Nester soils are examples of mature soils.

Human Activities

Important changes have taken place in the soils of the survey area since the county was settled. Cutting the forest, draining many of the wet soils, and developing large agricultural areas have altered the natural processes of soil formation.

Removal of the soil's protective forest cover and intensive cultivation of the land have resulted in erosion of the surface layer and the formation of a plow layer. The use of heavy machinery has resulted in compaction of the soil. Drainage of wet areas has lowered the water table, thus changing the chemistry of some of the soils by introducing more oxygen into the profile.

Processes of Soil Formation

The processes responsible for the development of soil horizons in the parent material are referred to as soil genesis. The physical, chemical, and biological properties of the horizons are referred to as soil morphology.

Several processes were involved in the development of horizons in the soils of Iosco County—the accumulation of organic matter, the leaching of lime (calcium carbonate), the formation and translocation of silicate clay minerals in loamy soils, and the translocation of iron, aluminum, and carbon in sandy soils. In most of the soils, more than one of these processes have been active in the development of distinct horizons.

As organic matter accumulates at the surface of a soil, an A horizon forms. If the soil is plowed, this horizon is mixed and becomes a plow layer, or Ap horizon. In the soils in Iosco County, the content of organic matter in the surface layer ranges from high to low. Sims soils, for example, have a high content of organic matter in the surface layer. Grayling soils have a low content of organic matter.

The leaching of carbonates and other bases has occurred in most of the soils. The leaching of bases generally precedes the translocation of silicate clay minerals. Many of the soils in Iosco County are moderately leached or strongly leached. For example, Nester soils are leached of carbonates to a depth of 40 inches, and Algonquin soils are leached to a depth of 17 inches. The difference in the depth of leaching is a result of the permeability of the parent material.

Gleying, or the reduction and transfer of iron, is evident in somewhat poorly drained soils. The gray subsoil of these soils indicates the reduction and loss of iron. Sims soils are examples of strongly gleyed soils.

The translocation of clay minerals contributes to horizon development in loamy soils. An eluviated, or leached, E horizon typically is lower in content of clay than the illuviated B horizon and typically is lighter in color. The B horizon typically has an accumulation of clay or clay films in pores and on the faces of peds. Soils at this stage of formation probably were leached of carbonates and soluble salts to a considerable extent before the silicate clays were translocated. Nester soils are examples of soils that have been affected by this process.

A fluctuating water table, both past and present, has an important effect on soil development. The vast areas of ortstein (a cemented sandy layer) in many of the sandy soils may be attributed to a fluctuating water table. The organic matter, iron, and aluminum in solution coat the sand grains; as the soil dries, these compounds act as a cementing agent. Finch and McIvor soils are somewhat poorly drained and have a nearly continuous horizon of ortstein. This process is ongoing in these soils. Crowell and Proper soils are somewhat excessively drained and moderately well drained and currently do not have a high water table; however, in the past these soils most likely had a water table higher in the profile that allowed the formation of ortstein. In these soils the ortstein is broken and occurs in columns, indicating that the downward movement of water is carrying off the organic matter, iron, and aluminum to lower areas in the profile and breaking down the ortstein layer.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

AC soil. A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Alpha,alpha-dipyridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redoximorphic feature.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Backslope. The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Basal area. The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a

resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Bog (map symbol). Water-logged, spongy ground, consisting primarily of acidic vegetation. Bogs normally occur in small closed depressional areas within map units of mineral soils.

Borrow pit (map symbol). An area where unconsolidated materials are being excavated.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breast height. An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Cable yarding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channery soil material. Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern

or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Conglomerate. A coarse grained, clastic rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coppice dune. A small dune of fine grained soil material stabilized around shrubs or small trees.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cut and fill spot (map symbol). An area where native soil has been removed or buried.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Delta. A body of alluvium having a surface that is nearly flat and fan shaped; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Depression (map symbol). A dry depression that is 4 feet deep or deeper in the middle than in the surrounding area.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches

deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained.* These classes are defined in the "Soil Survey Manual."

Drainage, surface. Runoff, or surface flow of water, from an area.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Dump (map symbol). An area of nonsoil material.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.

Esker. A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. An area cleared of flammable material to stop or help control creeping or running fires. It

also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flaggy soil material. Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Footslope. The position that forms the inner, gently inclined surface at the base of a hillslope. In profile, footslopes are commonly concave. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift. Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits. Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Gravel spot (map symbol). An area in which the surface texture is very gravelly or extremely gravelly surrounded by soils that do not have a gravelly surface layer.

Gravel strata spot (map symbol). An area that has strata of gravel in the subsoil.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head slope. A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time.

Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Interfluve. An elevated area between two drainageways that sheds water to those drainageways.

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame. An irregular, short ridge or hill of stratified glacial drift.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Limestone sinkhole (map symbol). A closed depression, 15 to 150 feet deep, formed by solution or collapse of limestone bedrock.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loam at depth (map symbol). An area of sandy soil in which loamy material is between depths of 20 and 40 inches.

Loamy spot (map symbol). An area of sandy soil in which loamy material is at the surface.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Marl spot (map symbol). An area of marl surrounded by mineral soils or muck.

Marsh. A water-saturated, very poorly drained area, intermittently or permanently water covered, having aquatic and grass-like vegetation, essentially without the formation of peat.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mine or quarry (map symbol). An area where hard bedrock has been removed.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Mineral spot (map symbol). An area of mineral soil within an area of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine. An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Nose slope. A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Organic spot (map symbol). A nonacid area of organic soil more than 9 inches thick surrounded by mineral soil.

Ortstein. A cemented horizon in which the cementing material consists of illuviated sesquioxides, mostly iron and organic matter.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Perennial stream. A stream or reach of a stream that flows continuously throughout the year and whose surface is generally lower than the water table in the area adjacent to the stream.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

Extremely slow	0.0 to 0.01 inch
Very slow	0.01 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8

Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Red beds. Sedimentary strata that are mainly red and are made up largely of sandstone and shale.

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandy spot (map symbol). An area of sandy soil that has a loamy or finer textured surface layer.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Second bottom. The first terrace above the normal flood plain (or first bottom) of a river.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Severely eroded spot (map symbol). An area in which the surface layer has been removed by erosion.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shallow bedrock (map symbol). An area in which bedrock is within a depth of 20 inches.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Short steep slope (map symbol). A narrow area with slopes typically between 8 and 18 percent. The soils above and below are nearly level to gently sloping.

Shoulder. The position that forms the uppermost inclined surface near the top of a hillslope. It is a transition from backslope to summit. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Side slope. A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, classes for simple slopes are as follows:

Nearly level	0 to 3 percent
Gently sloping	2 to 6 percent
Moderately sloping	6 to 12 percent
Strongly sloping	12 to 18 percent
Moderately steep	18 to 25 percent
Steep	25 to 35 percent
Very steep	35 percent and higher

Classes for complex slopes are as follows:

Nearly level	0 to 3 percent
Undulating	2 to 6 percent
Gently rolling	6 to 12 percent
Rolling	12 to 18 percent
Hilly	18 to 25 percent
Steep	25 to 35 percent
Very steep	35 percent and higher

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Sloughed till. Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10

Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Spring (map symbol). A site where ground water flows from the surface for at least 6 months of the year.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stony spot or very stony spot (map symbol). An area that is typically not cultivated because of large stones and boulders.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Summit. The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Till plain. An extensive area of nearly level to undulating soils underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The position that forms the gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Tufa. A porous rock formed as a deposit from springs or streams.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The uprooting and tipping over of trees by the wind.

Tables

Table 1.--Temperature and Precipitation

(Recorded in the period 1961-90 at Hale Loud Dam, Michigan)

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	27.9	8.5	18.2	49	-23	0	1.59	0.77	2.31	4	14.4
February---	30.5	8.5	19.5	52	-25	1	1.09	.53	1.57	3	9.6
March------	40.8	18.6	29.7	68	-16	26	1.67	.90	2.34	4	8.9
April------	54.5	30.7	42.6	81	10	150	2.11	1.40	2.76	5	2.4
May--------	67.7	41.2	54.5	88	25	448	2.61	1.38	3.69	5	.1
June-------	76.1	50.4	63.2	92	33	693	2.95	1.87	3.93	6	.0
July-------	80.8	55.9	68.4	94	40	875	2.93	1.63	4.08	5	.0
August-----	78.0	54.1	66.0	91	38	803	3.38	1.90	4.70	6	.0
September--	70.3	47.3	58.8	87	29	561	3.52	1.91	4.95	6	.0
October----	58.7	37.2	47.9	80	18	265	2.26	1.29	3.12	5	.2
November---	44.5	28.3	36.4	68	6	57	2.22	1.35	3.01	5	4.0
December---	31.7	16.5	24.1	56	-16	5	1.74	1.02	2.38	5	10.6
Yearly:											
Average---	55.1	33.1	44.1	---	---	---	---	---	---	---	---
Extreme---	100	-40	---	95	-27	---	---	---	---	---	---
Total-----	---	---	---	---	---	3,885	28.07	24.71	30.90	59	50.2

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F).

Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1961-90 at Hale Loud Dam, Michigan)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 1	May 18	June 5
2 years in 10 later than--	Apr. 27	May 13	May 31
5 years in 10 later than--	Apr. 20	May 5	May 20
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 13	Sept. 29	Sept. 14
2 years in 10 earlier than--	Oct. 17	Oct. 4	Sept. 19
5 years in 10 earlier than--	Oct. 26	Oct. 13	Sept. 28

Table 3.--Growing Season

(Recorded in the period 1961-90 at Hale Loud Dam, Michigan)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	170	141	109
8 years in 10	176	148	116
5 years in 10	188	160	131
2 years in 10	200	171	145
1 year in 10	206	178	153

Table 4.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
12B	Tawas-Au Gres complex, 0 to 4 percent slopes	195	0.1
13	Tawas-Lupton mucks	14,294	4.0
15A	Croswell-Au Gres sands, 0 to 3 percent slopes	319	0.1
16B	Graycalm sand, 0 to 6 percent slopes	10,730	3.0
16D	Graycalm sand, 12 to 18 percent slopes	70	*
17B	Croswell sand, 0 to 6 percent slopes	10,882	3.0
18A	Au Gres sand, 0 to 3 percent slopes	7,577	2.1
19	Leafriver muck	2,350	0.6
25B	Kent sandy loam, 2 to 6 percent slopes	815	0.2
25C	Kent sandy loam, 6 to 12 percent slopes	465	0.1
26B	Cublake sand, 0 to 6 percent slopes	1,280	0.4
27A	Tacoda sand, 0 to 3 percent slopes	588	0.2
28B	East Lake sand, 0 to 6 percent slopes	220	0.1
39B	Glennie loamy sand, 0 to 6 percent slopes	51	*
39C	Glennie loamy sand, 6 to 12 percent slopes	153	*
40A	Sprinkler sandy loam, 0 to 3 percent slopes	82	*
47D	Graycalm sand, 6 to 18 percent slopes	2,572	0.7
47F	Graycalm sand, 18 to 45 percent slopes	282	0.1
53B	Negwegon silt loam, 2 to 6 percent slopes	306	0.1
53C	Negwegon silt loam, 6 to 12 percent slopes	154	*
54A	Algonquin silt loam, 0 to 3 percent slopes	96	*
55	Springport clay loam	36	*
56C	Nester loam, 6 to 12 percent slopes	51	*
57B	Kawkawlin loam, 1 to 4 percent slopes	6,585	1.8
58A	Wakeley-Allendale complex, 0 to 3 percent slopes	399	0.1
59B	Algonquin-Springport complex, 0 to 6 percent slopes	25	*
62A	Allendale loamy sand, 0 to 3 percent slopes	3,626	1.0
70	Lupton muck	404	0.1
71	Tawas muck	405	0.1
72	Dorval muck	369	0.1
75B	Rubicon sand, 0 to 6 percent slopes	5,193	1.4
75D	Rubicon sand, 6 to 18 percent slopes	1,726	0.5
75E	Rubicon sand, 18 to 35 percent slopes	373	0.1
75F	Rubicon sand, 35 to 70 percent slopes	140	*
77	Rollaway muck, frequently flooded	25	*
78	Pits, borrow	75	*
81B	Grayling sand, 0 to 6 percent slopes	15,919	4.4
81D	Grayling sand, 6 to 18 percent slopes	2,336	0.6
81E	Grayling sand, 18 to 35 percent slopes	897	0.2
82C	Udorthents, loamy, nearly level to gently rolling	247	0.1
82F	Udorthents, loamy, very steep	1,772	0.5
83B	Udipsamments, nearly level and undulating	809	0.2
84B	Zimmerman loamy fine sand, 0 to 6 percent slopes	20	*
86	Histosols and Aquents, ponded	1,214	0.3
93B	Tacoda-Wakeley complex, 0 to 4 percent slopes	210	0.1
97	Colonville very fine sandy loam, occasionally flooded	1,280	0.4
100D	Curtisville sandy loam, 12 to 18 percent slopes	1,116	0.3
100E	Curtisville sandy loam, 18 to 25 percent slopes	1,020	0.3
103B	Nester sandy loam, 1 to 6 percent slopes	7,605	2.1
103C	Nester sandy loam, 6 to 12 percent slopes	2,550	0.7
108B	Selkirk loam, 0 to 4 percent slopes	2,705	0.7
114A	Ingalls sand, 0 to 3 percent slopes	1,794	0.5
120B	Morganlake sand, 0 to 6 percent slopes	6,117	1.7
120C	Morganlake sand, 6 to 12 percent slopes	759	0.2
123D	Klacking sand, 6 to 18 percent slopes	20	*
124	Evart sand	48	*
127	Cathro muck	87	*
128	Dawson peat	735	0.2
130	Grousehaven muck	290	0.1
159A	Finch sand, 0 to 3 percent slopes	1,432	0.4
182	Pits, quarry	399	0.1
197A	Gladwin loamy sand, 0 to 3 percent slopes	511	0.1

See footnote at end of table.

Table 4.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
209B	Grayling sand, calcareous substratum, nearly level and undulating	36,846	10.2
209C	Grayling sand, calcareous substratum, rolling	4,045	1.1
209D	Grayling sand, calcareous substratum, hilly	1,023	0.3
210B	Grayling sand, nearly level and undulating	5,254	1.5
210C	Grayling sand, rolling	2,408	0.7
210D	Grayling sand, hilly	1,606	0.4
210E	Grayling sand, steep	829	0.2
211B	Grayling sand, banded substratum, nearly level and undulating	2,909	0.8
212B	Grayling sand, very deep water table, nearly level and undulating	11,327	3.1
213B	Graycalm sand, nearly level and undulating	135	*
214B	Typic Udipsamments, deep water table, nearly level and undulating	728	0.2
215B	Typic Udipsamments, loamy substratum, nearly level and undulating	98	*
216B	Typic Udipsamments, loamy calcareous substratum, nearly level and undulating	550	0.2
220B	Typic Udipsamments, nearly level and undulating	196	0.1
220D	Typic Udipsamments, hilly	226	0.1
220E	Typic Udipsamments, steep	549	0.2
221B	Typic Udipsamments, banded substratum, nearly level and undulating	908	0.3
221C	Typic Udipsamments, banded substratum, rolling	1,028	0.3
221D	Typic Udipsamments, banded substratum, hilly	676	0.2
221E	Typic Udipsamments, banded substratum, steep	157	*
222B	Typic Udipsamments, very deep water table, nearly level and undulating	1,891	0.5
223B	Graycalm-Grayling sands, nearly level and undulating	963	0.3
223C	Graycalm-Grayling sands, rolling	229	0.1
223D	Graycalm-Grayling sands, hilly	55	*
223E	Graycalm-Grayling sands, steep	158	*
224B	Croswell sand, nearly level and undulating	4,021	1.1
225B	Entic Haplorthods, sandy, loamy substratum, nearly level and undulating	611	0.2
225C	Entic Haplorthods, sandy, loamy substratum, rolling	335	0.1
231D	Entic Haplorthods, sandy, banded substratum-Alfic Haplorthods, sandy, complex, hilly	104	*
231E	Entic Haplorthods, sandy, banded substratum-Alfic Haplorthods, sandy, complex, steep	185	0.1
232B	Entic Haplorthods, sandy-Alfic Haplorthods, sandy, complex, very deep water table, nearly level and undulating	505	0.1
233B	Alfic Haplorthods, sandy-Entic Haplorthods, sandy, fine-loamy banded substratum, complex, nearly level and undulating	47	*
233C	Alfic Haplorthods, sandy-Entic Haplorthods, sandy, fine-loamy banded substratum, complex, rolling	25	*
233D	Alfic Haplorthods, sandy-Entic Haplorthods, sandy, fine-loamy banded substratum, complex, hilly	46	*
235B	Alfic Haplorthods, sandy over loamy-Alfic Haplorthods, sandy, complex, nearly level and undulating	826	0.2
235C	Alfic Haplorthods, sandy over loamy-Alfic Haplorthods, sandy, complex, rolling	313	0.1
236B	Arenic Eutroboralfs, loamy, nearly level and undulating	151	*
237B	Eutroboralfs, nearly level and undulating	235	0.1
237D	Eutroboralfs, hilly	106	*
254A	Borosaprists, euic-Fluvaquents-Aquic Udipsamments complex, nearly level	8,702	2.4
262A	Au Gres sand, nearly level	4,674	1.3
263A	Argic Endoaquods, nearly level	1,275	0.4
264A	Allendale loamy sand, nearly level	497	0.1
265B	Eutroboralfs-Allendale complex, nearly level and undulating	337	0.1
266A	Typic Duraquods, sandy, nearly level	2,080	0.6
272	Endoaquods-Fluvaquents complex	1,600	0.4
273	Leafriver-Wakeley complex	597	0.2
274	Typic Endoaquods	397	0.1
280	Aquents and Histosols, ponded	455	0.1
281	Borosaprists, dysic	317	0.1
282	Borosaprists, euic	8,844	2.4
343	Sims loam, drained	944	0.3
355E	Crowell-Proper complex, 4 to 25 percent slopes	1,286	0.4
356E	Aquepts-Histosols-Fluvaquents complex, nearly level to very steep	2,063	0.6
357B	Udipsamments-Urban land complex, 0 to 8 percent slopes	3,658	1.0
360	Wakeley muck	2,271	0.6

See footnote at end of table.

Table 4.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
367A	Whittemore-Springport complex, 0 to 3 percent slopes	3,593	1.0
368A	Au Gres-Deford complex, 0 to 3 percent slopes	7,434	2.1
369	Deford muck	14,720	4.1
370A	McIvor sand, 0 to 3 percent slopes	3,270	0.9
371	Springport silt loam	1,271	0.4
372B	Proper-Leafriver complex, 0 to 6 percent slopes	976	0.3
375	Kanotin muck	1,912	0.5
377	Wabun mucky sand	1,812	0.5
378A	Algonquin clay, 0 to 3 percent slopes	3,184	0.9
379A	Algonquin-Springport complex, 0 to 3 percent slopes	1,158	0.3
380	Access denied	614	0.2
381A	McIvor-Wakeley complex, 0 to 3 percent slopes	4,284	1.2
382B	Proper sand, 0 to 6 percent slopes	1,159	0.3
383B	Wurtsmith sand, 0 to 6 percent slopes	1,955	0.5
392	Caffey mucky sand	1,013	0.3
403B	Iargo silt loam, 2 to 6 percent slopes	1,273	0.4
403C	Iargo silt loam, 6 to 12 percent slopes	320	0.1
404A	Manary silty clay loam, 0 to 3 percent slopes	2,582	0.7
405B	Manary-Iargo complex, 0 to 6 percent slopes	1,909	0.5
406A	Winterfield loamy sand, rarely flooded, 0 to 2 percent slopes	1,024	0.3
407	Lacota loam	754	0.2
408	Sims loam	666	0.2
409A	Finch-Deford-Au Gres complex, 0 to 3 percent slopes	2,049	0.6
410B	Proper-Finch-Deford complex, 0 to 6 percent slopes	894	0.2
411A	Meehan sand, 0 to 3 percent slopes	2,354	0.7
425D	Hottis sandy loam, 12 to 18 percent slopes	433	0.1
426B	Coppler loamy sand, 0 to 6 percent slopes	760	0.2
426C	Coppler loamy sand, 6 to 12 percent slopes	68	*
427	Tonkey sandy loam	55	*
429D	Menominee sand, 12 to 18 percent slopes	194	0.1
430D	Mongo loam, 12 to 18 percent slopes	276	0.1
430E	Mongo loam, 18 to 35 percent slopes	215	0.1
431B	Skeel loamy sand, 0 to 6 percent slopes	1,140	0.3
432B	Wurtsmith-Meehan sands, 0 to 6 percent slopes	908	0.3
433B	Morganlake-Graycalm sands, 0 to 6 percent slopes	252	0.1
434D	Graycalm-Menominee-Morganlake sands, 6 to 18 percent slopes	245	0.1
435B	Skeel-Algonquin-Aquepts complex, 0 to 6 percent slopes	315	0.1
436A	Manary-Whittemore-Springport complex, 0 to 3 percent slopes	2,487	0.7
437D	Wurtsmith-Meehan-Deer Park sands, 0 to 18 percent slopes	567	0.2
438C	Meehan-Tawas-Wurtsmith complex, 0 to 12 percent slopes	3,332	0.9
439D	Deer Park sand, 4 to 18 percent slopes	3,241	0.9
440B	Kawkawlin-Sims complex, 0 to 4 percent slopes	3,753	1.0
441B	Morganlake-Nester complex, 0 to 6 percent slopes	3,870	1.1
441C	Morganlake-Nester complex, 6 to 12 percent slopes	227	0.1
442D	Menominee-Curtisville complex, 12 to 18 percent slopes	199	0.1
442E	Menominee-Curtisville complex, 18 to 35 percent slopes	286	0.1
443B	Kawkawlin-Allendale-Aquepts complex, 0 to 4 percent slopes	2,129	0.6
444B	Kawkawlin sandy loam, 0 to 4 percent slopes	6,690	1.8
445A	Corsair very fine sandy loam, 0 to 3 percent slopes	318	0.1
446B	Wurtsmith-Meehan-Urban land complex, 0 to 6 percent slopes	456	0.1
447A	Whittemore sand, 0 to 3 percent slopes	844	0.2
448A	Meehan-Tawas complex, 0 to 3 percent slopes	873	0.2
449A	Kokosing sand, 0 to 3 percent slopes	2,556	0.7
W	Water	15,805	0.9
	Total	361,837	100.0

* Less than 0.1 percent.

Table 5.--Land Capability and Yields per Acre of Crops

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability	Corn	Corn silage	Oats	Alfalfa hay	Winter wheat	Barley	Soybeans
		Bu	Tons	Bu	Tons	Bu	Bu	Bu
12B------------- Tawas-Au Gres	VIw	---	---	---	---	---	---	---
13-------------- Tawas and Lupton	VIw	---	---	---	---	---	---	---
15A------------- Croswell-Au Gres	IVs	53	9.5	48	---	26	---	---
16B------------- Graycalm	IVs	---	---	---	---	---	---	---
16D------------- Graycalm	VIs	---	---	---	---	---	---	---
17B------------- Croswell	IVs	50	9.0	50	2.5	25	---	---
18A------------- Au Gres	IVw	55	10.0	45	---	25	---	---
19-------------- Leafriver	VIw	---	---	---	---	---	---	---
25B------------- Kent	IIIe	75	12.0	70	3.5	32	---	20
25C------------- Kent	IIIe	65	10.0	60	3.0	30	---	17
26B------------- Cublake	IVs	50	8.0	50	---	25	---	---
27A------------- Tacoda	IVw	---	10.0	65	3.0	---	---	---
28B------------- East Lake	IVs	50	9.0	40	2.5	---	---	---
39B------------- Glennie	IIIs	75	12.0	---	3.5	---	---	---
39C------------- Glennie	IIIe	70	11.0	---	3.2	---	---	---
40A------------- Sprinkler	IIw	80	13.0	80	---	---	---	---
47D------------- Graycalm	VIs	---	---	---	---	---	---	---
47F------------- Graycalm	VIIs	---	---	---	---	---	---	---

Table 5.--Land Capability and Yields per Acre of Crops--Continued

Soil name and map symbol	Land capability	Corn	Corn silage	Oats	Alfalfa hay	Winter wheat	Barley	Soybeans
		Bu	Tons	Bu	Tons	Bu	Bu	Bu
53B------------- Negwegon	IIIe	75	12.0	70	3.5	---	---	---
53C------------- Negwegon	IIIe	68	10.0	65	3.1	---	---	---
54A------------- Algonquin	IIIw	80	13.0	75	3.5	---	---	---
55-------------- Springport	IIIw	85	14.0	75	3.5	---	---	---
56C------------- Nester	IIIe	70	13.0	70	3.5	36	---	24
57B------------- Kawkawlin	IIe	85	16.0	80	3.8	42	---	35
58A------------- Wakeley-Allendale	Vw	---	---	---	---	---	---	---
59B------------- Algonquin-Springport	IIIw	---	---	---	---	---	---	---
62A------------- Allendale	IIIw	85	14.0	75	3.5	40	---	---
70-------------- Lupton	VIw	---	---	---	---	---	---	---
71-------------- Tawas	VIw	---	---	---	---	---	---	---
72-------------- Dorval	Vw	---	---	---	---	---	---	---
75B------------- Rubicon	VIs	---	---	---	2.0	---	---	---
75D, 75E, 75F--- Rubicon	VIIs	---	---	---	---	---	---	---
77-------------- Rollaway	Vw	---	---	---	---	---	---	---
78. Pits								
81B------------- Grayling	VIs	---	---	---	---	---	---	---
81D------------- Grayling	VIIs	---	---	---	---	---	---	---
81E------------- Grayling	VIIs	---	---	---	---	---	---	---
82C, 82F. Udorthents								

Table 5.--Land Capability and Yields per Acre of Crops--Continued

Soil name and map symbol	Land capability	Corn	Corn silage	Oats	Alfalfa hay	Winter wheat	Barley	Soybeans
		Bu	Tons	Bu	Tons	Bu	Bu	Bu
83B. Udipsamments								
84B----------- Zimmerman	IVs	50	10.0	40	---	---	---	---
86. Histosols and Aquents								
93B----------- Tacoda-Wakeley	Vw	---	---	---	---	---	---	---
97------------ Colonville	Vw	---	---	---	---	---	---	---
100D---------- Curtisville	IVe	60	11.0	65	3.1	32	---	18
100E---------- Curtisville	VIIe	---	---	---	---	---	---	---
103B---------- Nester	IIe	80	14.0	75	3.7	40	---	30
103C---------- Nester	IIIe	70	13.0	70	3.5	36	---	24
108B---------- Selkirk	IIIe	80	14.0	75	3.5	35	---	---
114A---------- Ingalls	IIIw	85	14.0	75	3.5	40	---	---
120B---------- Morganlake	IIIs	75	12.0	70	3.5	35	---	---
120C---------- Morganlake	IIIe	65	12.0	65	3.3	30	---	---
123D---------- Klacking	IVe	---	8.0	45	2.0	---	---	---
124----------- Evart	VIIw	---	---	---	---	---	---	---
127----------- Cathro	VIw	---	---	---	---	---	---	---
128----------- Dawson	VIIw	---	---	---	---	---	---	---
130----------- Grousehaven	VIIw	---	---	---	---	---	---	---
159A---------- Finch	IVw	45	9.0	40	---	22	---	---
182. Pits								

Table 5.--Land Capability and Yields per Acre of Crops--Continued

Soil name and map symbol	Land capability	Corn	Corn silage	Oats	Alfalfa hay	Winter wheat	Barley	Soybeans
		Bu	Tons	Bu	Tons	Bu	Bu	Bu
197A------------ Gladwin	IIIw	70	12.0	65	3.0	35	---	23
343------------- Sims	Vw	---	---	---	---	---	---	---
355E------------ Crowell-Proper	VIIs	---	---	---	---	---	---	---
356E. Aquepts-Histosols-Fluvaquents								
357B. Udipsamments-Urban land								
360------------- Wakeley	Vw	---	---	---	---	---	---	---
367A------------ Whittemore-Springport	IIIw	---	---	---	---	---	---	---
368A------------ Au Gres-Deford	Vw	---	---	---	---	---	---	---
369------------- Deford	Vw	---	---	---	---	---	---	---
370A------------ McIvor	IVw	---	---	---	---	---	---	---
371------------- Springport	Vw	---	---	---	---	---	---	---
372B------------ Proper-Leafriver	VIw	---	---	---	---	---	---	---
375------------- Kanotin	Vw	---	---	---	---	---	---	---
377------------- Wabun	Vw	---	---	---	---	---	---	---
378A------------ Algonquin	IIIw	80	13.0	---	3.5	---	---	---
379A------------ Algonquin-Springport	Vw	---	---	---	---	---	---	---
380. Access denied								
381A------------ McIvor-Wakeley	IVw	---	---	---	---	---	---	---

Table 5.--Land Capability and Yields per Acre of Crops--Continued

Soil name and map symbol	Land capability	Corn	Corn silage	Oats	Alfalfa hay	Winter wheat	Barley	Soybeans
		Bu	Tons	Bu	Tons	Bu	Bu	Bu
382B------------ Proper	IVs	50	9.0	50	2.5	25	---	---
383B------------ Wurtsmith	IVs	---	---	---	---	---	---	---
392------------- Caffey	Vw	---	---	---	---	---	---	---
403B------------ Iargo	IIIe	100	16.0	85	5.0	55	---	---
403C------------ Iargo	IIIe	95	15.0	80	4.7	50	---	---
404A------------ Manary	IIw	85	14.0	80	3.7	42	---	---
405B------------ Manary-Iargo	IIw	93	15.0	83	4.4	49	---	---
406A------------ Winterfield	IVw	---	---	---	---	---	---	---
407------------- Lacota	Vw	---	---	---	---	---	---	---
408------------- Sims	Vw	---	---	---	---	---	---	---
409A------------ Finch-Deford-Au Gres	IVw	---	---	---	---	---	---	---
410B------------ Proper-Finch-Deford	IVw	---	---	---	---	---	---	---
411A------------ Meehan	IVw	55	9.0	50	---	---	---	18
425D------------ Hottis	IVe	60	11.0	65	3.5	32	---	---
426B------------ Coppler	IIIs	65	11.0	55	3.0	24	---	---
426C------------ Coppler	IIIe	---	---	---	---	---	---	---
427------------- Tonkey	Vw	---	---	---	---	---	---	---
429D------------ Menominee	IVe	75	13.0	70	3.5	35	---	---
430D------------ Mongo	IVe	---	---	---	2.8	---	---	---

Table 5.--Land Capability and Yields per Acre of Crops--Continued

Soil name and map symbol	Land capability	Corn	Corn silage	Oats	Alfalfa hay	Winter wheat	Barley	Soybeans
		Bu	Tons	Bu	Tons	Bu	Bu	Bu
430E------------ Mongo	VIIe	---	---	---	---	---	---	---
431B------------ Skeel	IIIs	90	16.0	80	4.2	45	---	---
432B------------ Wurtsmith-Meehan	IVw	---	---	---	---	---	---	---
433B------------ Morganlake-Graycalm	IIIs	---	---	---	---	---	---	---
434D------------ Graycalm-Menominee-Morganlake	VIs	---	---	---	---	---	---	---
435B------------ Skeel-Algonquin-Aquepts	IIIs	---	---	---	---	---	---	---
436A------------ Manary-Whittemore-Springport	IIw	---	---	---	---	---	---	---
437D------------ Wurtsmith-Meehan-Deer Park	IVs	---	---	---	---	---	---	---
438C------------ Meehan-Tawas-Wurtsmith	IVw	---	---	---	---	---	---	---
439D------------ Deer Park	VIIs	---	---	---	---	---	---	---
440B------------ Kawkawlin-Sims	Vw	---	---	---	---	---	---	---
441B------------ Morganlake-Nester	IIIs	78	13.0	73	3.7	38	---	---
441C------------ Morganlake-Nester	IIIs	68	12.5	68	3.5	33	---	---
442D------------ Menominee-Curtisville	VIIs	68	12.0	68	3.4	34	---	---
442E------------ Menominee-Curtisville	VIIs	---	---	---	---	---	---	---

Table 5.--Land Capability and Yields per Acre of Crops--Continued

Soil name and map symbol	Land capability	Corn	Corn silage	Oats	Alfalfa hay	Winter wheat	Barley	Soybeans
		Bu	Tons	Bu	Tons	Bu	Bu	Bu
443B------------ Kawkawlin-Allendale-Aquepts	IIIw	---	---	---	---	---	---	---
444B------------ Kawkawlin	IIe	85	16.0	80	3.8	42	---	35
445A------------ Corsair	IIIw	85	14.0	85	3.5	40	---	---
446B:								
Wurtsmith-Meehan--------	IVs	---	---	---	---	---	---	---
Urban land.								
447A------------ Whittemore	IIIw	80	12.0	---	3.5	---	---	---
448A------------ Meehan-Tawas	IVs	---	---	---	---	---	---	---
449A------------ Kokosing	IIIw	85	15.0	75	3.5	40	---	---

Table 6.--Prime Farmland

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
25B	Kent sandy loam, 2 to 6 percent slopes
40A	Sprinkler sandy loam, 0 to 3 percent slopes (where drained)
53B	Negwegon silt loam, 2 to 6 percent slopes
54A	Algonquin silt loam, 0 to 3 percent slopes (where drained)
55	Springport clay loam (where drained)
57B	Kawkawlin loam, 1 to 4 percent slopes (where drained)
59B	Algonquin-Springport complex, 0 to 6 percent slopes (where drained)
103B	Nester sandy loam, 1 to 6 percent slopes
108B	Selkirk loam, 0 to 4 percent slopes (where drained)
114A	Ingalls sand, 0 to 3 percent slopes
343	Sims loam, drained
371	Springport silt loam (where drained)
378A	Algonquin clay, 0 to 3 percent slopes (where drained)
379A	Algonquin-Springport complex, 0 to 3 percent slopes (where drained)
403B	Iargo silt loam, 2 to 6 percent slopes
405B	Manary-Iargo complex, 0 to 6 percent slopes (where drained)
407	Lacota loam (where drained)
427	Tonkey sandy loam (where drained)
436A	Manary-Whittemore-Springport complex, 0 to 3 percent slopes (where drained)
440B	Kawkawlin-Sims complex, 0 to 4 percent slopes (where drained)
441B	Morganlake-Nester complex, 0 to 6 percent slopes
444B	Kawkawlin sandy loam, 0 to 4 percent slopes (where drained)
445A	Corsair very fine sandy loam, 0 to 3 percent slopes (where drained)

Table 7.--Woodland Management and Productivity

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Productivity class*	Trees to plant
12B:										
Tawas-----------	5W	Slight	Severe	Severe	Severe	Severe	Balsam fir----------	40	5	---
							Black ash-----------	---	---	
							Eastern arborvitae--	---	---	
							Quaking aspen-------	---	---	
							Red maple-----------	---	---	
Au Gres---------	6W	Slight	Severe	Moderate	Severe	Severe	Balsam fir----------	---	---	Norway spruce, eastern white pine, red pine, white spruce.
							Bigtooth aspen------	---	---	
							Eastern arborvitae--	---	---	
							Eastern hemlock-----	---	---	
							Eastern white pine--	---	---	
							Jack pine-----------	51	5	
							Paper birch---------	---	---	
							Quaking aspen-------	70	6	
							Red maple-----------	65	3	
							Yellow birch--------	---	---	
13:										
Tawas-----------	5W	Slight	Severe	Severe	Severe	Severe	Balsam fir----------	40	5	---
							Black ash-----------	---	---	
							Eastern arborvitae--	---	---	
							Quaking aspen-------	---	---	
							Red maple-----------	---	---	
Lupton----------	2W	Slight	Severe	Severe	Severe	Severe	Balsam fir----------	46	6	---
							Black ash-----------	---	---	
							Black spruce--------	20	2	
							Eastern arborvitae--	---	---	
							Paper birch---------	---	---	
							Quaking aspen-------	---	---	
							Red maple-----------	---	---	
							Tamarack------------	---	---	
							White spruce--------	---	---	
15A:										
Croswell--------	5S	Slight	Moderate	Moderate	Moderate	Severe	Bigtooth aspen------	69	6	Eastern white pine, red pine, white spruce.
							Black cherry--------	---	---	
							Eastern white pine--	---	---	
							Jack pine-----------	53	5	
							Northern red oak----	---	---	
							Paper birch---------	54	4	
							Quaking aspen-------	68	5	
							Red maple-----------	---	---	
							Red pine------------	55	6	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
15A:										
Au Gres	6W	Slight	Severe	Moderate	Severe	Severe	Balsam fir	---	---	Norway spruce, eastern white pine, red pine, white spruce.
							Bigtooth aspen	---	---	
							Eastern arborvitae	---	---	
							Eastern hemlock	---	---	
							Eastern white pine	---	---	
							Jack pine	51	5	
							Paper birch	---	---	
							Quaking aspen	70	6	
							Red maple	65	3	
							Yellow birch	---	---	
16B:										
Graycalm	6S	Slight	Moderate	Moderate	Slight	Severe	Bigtooth aspen	70	6	Eastern white pine, red pine.
							Eastern white pine	---	---	
							Jack pine	56	6	
							Northern red oak	62	4	
							Paper birch	---	---	
							Quaking aspen	60	4	
							Red pine	61	7	
16D:										
Graycalm	6S	Slight	Moderate	Moderate	Slight	Moderate	Bigtooth aspen	70	6	Eastern white pine, red pine.
							Eastern white pine	---	---	
							Jack pine	56	6	
							Northern red oak	62	4	
							Paper birch	---	---	
							Quaking aspen	60	4	
							Red pine	61	7	
17B:										
Croswell	5S	Slight	Moderate	Moderate	Moderate	Moderate	Bigtooth aspen	69	6	Eastern white pine, red pine, white spruce.
							Black cherry	---	---	
							Eastern white pine	---	---	
							Jack pine	53	5	
							Northern red oak	---	---	
							Paper birch	54	4	
							Quaking aspen	68	5	
18A:										
Au Gres	6W	Slight	Severe	Moderate	Severe	Severe	Balsam fir	---	---	Norway spruce, eastern white pine, red pine, white spruce.
							Bigtooth aspen	---	---	
							Eastern arborvitae	---	---	
							Eastern hemlock	---	---	
							Eastern white pine	---	---	
							Jack pine	51	5	
							Paper birch	---	---	
							Quaking aspen	70	6	
							Red maple	65	3	
							Yellow birch	---	---	
19:										
Leafriver	2W	Slight	Severe	Severe	Severe	Severe	Black spruce	---	---	---
							Eastern arborvitae	---	---	
							Quaking aspen	45	2	
							Tamarack	---	---	
							Red maple	---	---	
							Red pine	55	6	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Productivity class*	Trees to plant
25B:										
Kent------------	8C	Slight	Severe	Slight	Moderate	Moderate	American basswood---	55	2	Eastern white pine, white spruce.
							American beech------	---	---	
							American elm--------	---	---	
							Balsam fir----------	54	7	
							Eastern hemlock-----	---	---	
							Eastern white pine--	---	---	
							Paper birch---------	63	5	
							Quaking aspen-------	---	---	
							Sugar maple---------	---	---	
							White spruce--------	54	8	
25C:										
Kent------------	8C	Slight	Severe	Slight	Moderate	Moderate	American basswood---	55	2	Eastern white pine, white spruce.
							American beech------	---	---	
							American elm--------	---	---	
							Balsam fir----------	54	7	
							Eastern hemlock-----	---	---	
							Eastern white pine--	---	---	
							Paper birch---------	63	5	
							Quaking aspen-------	---	---	
							Sugar maple---------	---	---	
							White spruce--------	54	8	
26B:										
Cublake---------	7A	Slight	Slight	Slight	Slight	Moderate	Balsam fir----------	---	---	Eastern white pine, jack pine, red pine.
							Eastern white pine--	---	---	
							Northern red oak----	---	---	
							Paper birch---------	---	---	
							Quaking aspen-------	---	---	
							Red maple-----------	---	---	
							Red pine------------	60	7	
27A:										
Tacoda----------	4W	Slight	Severe	Moderate	Moderate	Moderate	Balsam fir----------	---	---	Eastern white pine, white spruce.
							Eastern white pine--	---	---	
							Paper birch---------	---	---	
							Quaking aspen-------	60	4	
							Red maple-----------	---	---	
							White ash-----------	---	---	
							White spruce--------	---	---	
28B:										
East Lake-------	2S	Slight	Moderate	Moderate	Slight	Slight	Jack pine-----------	---	---	Eastern white pine, jack pine, red pine.
							Northern red oak----	---	---	
							Paper birch---------	---	---	
							Quaking aspen-------	---	---	
							Red maple-----------	53	2	
							Red pine------------	55	6	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
39B:										
Glennie---------	5D	Slight	Moderate	Slight	Moderate	Moderate	American beech------	---	---	Eastern white pine, red pine, white spruce.
							Balsam fir----------	---	---	
							Bigtooth aspen------	---	---	
							Eastern white pine--	---	---	
							Northern red oak----	72	5	
							Paper birch---------	---	---	
							Red maple-----------	---	---	
							White ash-----------	---	---	
39C:										
Glennie---------	5D	Slight	Moderate	Slight	Moderate	Moderate	American beech------	---	---	Eastern white pine, red pine, white spruce.
							Balsam fir----------	---	---	
							Bigtooth aspen------	---	---	
							Eastern white pine--	---	---	
							Northern red oak----	72	5	
							Paper birch---------	---	---	
							Red maple-----------	---	---	
							White ash-----------	---	---	
40A:										
Sprinkler-------	3W	Slight	Severe	Moderate	Severe	Severe	Balsam fir----------	---	---	Eastern white pine, white spruce.
							Bigtooth aspen------	---	---	
							Black ash-----------	---	---	
							Eastern white pine--	---	---	
							Paper birch---------	---	---	
							Quaking aspen-------	---	---	
							Red maple-----------	60	3	
47D:										
Graycalm--------	6S	Slight	Moderate	Moderate	Slight	Slight	Bigtooth aspen------	70	6	Eastern white pine, red pine.
							Eastern white pine--	---	---	
							Jack pine-----------	56	6	
							Northern red oak----	62	4	
							Paper birch---------	---	---	
							Quaking aspen-------	60	4	
							Red pine------------	61	7	
47F:										
Graycalm--------	6R	Severe	Severe	Moderate	Slight	Severe	Bigtooth aspen------	70	6	Eastern white pine, red pine.
							Eastern white pine--	---	---	
							Jack pine-----------	56	6	
							Northern red oak----	62	4	
							Paper birch---------	---	---	
							Quaking aspen-------	60	4	
							Red pine------------	61	7	
53B:										
Negwegon--------	3A	Slight	Moderate	Slight	Moderate	Severe	American beech------	---	---	Eastern white pine, white spruce.
							Balsam fir----------	---	---	
							Bigtooth aspen------	---	---	
							Eastern hemlock-----	---	---	
							Northern red oak----	---	---	
							Sugar maple---------	62	3	
							White ash-----------	---	---	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
53C:										
Negwegon	3A	Slight	Moderate	Slight	Moderate	Severe	American beech	---	---	Eastern white pine, white spruce.
							Balsam fir	---	---	
							Bigtooth aspen	---	---	
							Eastern hemlock	---	---	
							Northern red oak	---	---	
							Sugar maple	62	3	
							White ash	---	---	
54A:										
Algonquin	6W	Slight	Severe	Moderate	Severe	Severe	Balsam fir	45	6	Eastern arborvitae, eastern white pine, white spruce.
							Balsam poplar	---	---	
							Black ash	---	---	
							Eastern arborvitae	---	---	
							Paper birch	---	---	
							Quaking aspen	---	---	
							Red maple	---	---	
55:										
Springport	6W	Slight	Severe	Severe	Severe	Severe	Balsam fir	45	6	Eastern arborvitae, eastern white pine, white spruce.
							Balsam poplar	---	---	
							Black ash	---	---	
							Eastern arborvitae	---	---	
							Paper birch	---	---	
							Quaking aspen	---	---	
56C:										
Nester	3A	Slight	Moderate	Slight	Slight	Moderate	American basswood	---	---	Eastern white pine, red pine, white spruce.
							American beech	---	---	
							Black cherry	---	---	
							Northern red oak	---	---	
							Quaking aspen	---	---	
							Sugar maple	66	3	
							White ash	---	---	
							White oak	---	---	
57B:										
Kawkawlin	3W	Slight	Severe	Slight	Moderate	Severe	American basswood	---	---	Norway spruce, eastern white pine, red pine, white spruce.
							Bigtooth aspen	---	---	
							Northern red oak	---	---	
							Quaking aspen	---	---	
							Red maple	---	---	
							Sugar maple	60	3	
							Swamp white oak	---	---	
							White ash	---	---	
58A:										
Wakeley	3W	Slight	Severe	Severe	Severe	Severe	Balsam fir	---	---	Eastern arborvitae.
							Black spruce	---	---	
							Eastern arborvitae	---	---	
							Quaking aspen	50	3	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
58A:										
Allendale	4W	Slight	Severe	Moderate	Moderate	Moderate	Balsam fir	---	---	Eastern white pine, white spruce.
							Eastern white pine	---	---	
							Paper birch	---	---	
							Quaking aspen	60	4	
							Red maple	---	---	
							White ash	---	---	
							White spruce	---	---	
59B:										
Algonquin	6W	Slight	Severe	Moderate	Severe	Severe	Balsam fir	45	6	Eastern arborvitae, eastern white pine, white spruce.
							Balsam poplar	---	---	
							Black ash	---	---	
							Eastern arborvitae	---	---	
							Paper birch	---	---	
							Quaking aspen	---	---	
							Red maple	---	---	
Springport	6W	Slight	Severe	Severe	Severe	Severe	Balsam fir	45	6	Eastern arborvitae, eastern white pine, white spruce.
							Balsam poplar	---	---	
							Black ash	---	---	
							Eastern arborvitae	---	---	
							Paper birch	---	---	
							Quaking aspen	---	---	
62A:										
Allendale	4W	Slight	Severe	Slight	Slight	Moderate	Balsam fir	---	---	Eastern white pine, white spruce.
							Eastern white pine	---	---	
							Paper birch	---	---	
							Quaking aspen	60	4	
							Red maple	---	---	
							White ash	---	---	
							White spruce	---	---	
70:										
Lupton	2W	Slight	Severe	Severe	Severe	Severe	Balsam fir	46	6	---
							Black ash	---	---	
							Black spruce	20	2	
							Eastern arborvitae	---	---	
							Paper birch	---	---	
							Quaking aspen	---	---	
							Red maple	---	---	
							Tamarack	---	---	
							White spruce	---	---	
71:										
Tawas	5W	Slight	Severe	Severe	Severe	Severe	Balsam fir	40	5	---
							Black ash	---	---	
							Eastern arborvitae	---	---	
							Quaking aspen	---	---	
							Red maple	---	---	
72:										
Dorval	2W	Slight	Severe	Severe	Severe	Severe	American elm	---	---	Eastern arborvitae, white spruce.
							Eastern arborvitae	---	---	
							Red maple	50	2	
							White ash	---	---	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Productivity class*	Trees to plant
75B:										
Rubicon---------	4S	Slight	Moderate	Moderate	Slight	Slight	Bigtooth aspen------	66	5	Eastern white pine, jack pine, red pine.
							Eastern white pine--	45	5	
							Jack pine-----------	53	5	
							Northern red oak----	---	---	
							Paper birch---------	---	---	
							Quaking aspen-------	60	4	
							Red maple-----------	57	2	
							Red pine------------	53	6	
							White oak-----------	---	---	
75D:										
Rubicon---------	4S	Slight	Moderate	Moderate	Slight	Slight	Bigtooth aspen------	66	5	Eastern white pine, jack pine, red pine.
							Eastern white pine--	45	5	
							Jack pine-----------	53	5	
							Northern red oak----	---	---	
							Paper birch---------	---	---	
							Quaking aspen-------	60	4	
							Red maple-----------	57	2	
							Red pine------------	53	6	
							White oak-----------	---	---	
75E:										
Rubicon---------	4R	Moderate	Moderate	Moderate	Slight	Slight	Bigtooth aspen------	66	5	Eastern white pine, jack pine, red pine.
							Eastern white pine--	45	5	
							Jack pine-----------	53	5	
							Northern red oak----	---	---	
							Paper birch---------	---	---	
							Quaking aspen-------	60	4	
							Red maple-----------	57	2	
							Red pine------------	53	6	
							White oak-----------	---	---	
75F:										
Rubicon---------	4R	Severe	Severe	Moderate	Slight	Slight	Bigtooth aspen------	66	5	Eastern white pine, jack pine, red pine.
							Eastern white pine--	45	5	
							Jack pine-----------	53	5	
							Northern red oak----	---	---	
							Paper birch---------	---	---	
							Quaking aspen-------	60	4	
							Red maple-----------	57	2	
							Red pine------------	53	6	
							White oak-----------	---	---	
77:										
Rollaway--------	3W	Slight	Severe	Severe	Severe	Severe	Balsam fir----------	40	5	---
							Black ash-----------	35	2	
							Black spruce--------	---	---	
							Eastern arborvitae--	30	3	
							Quaking aspen-------	40	2	
							Red maple-----------	---	---	
81B:										
Grayling--------	4S	Slight	Moderate	Moderate	Slight	Slight	Jack pine-----------	48	4	Jack pine, red pine.
							Northern pin oak----	43	2	
							Quaking aspen-------	---	---	
							Red pine------------	---	---	
							White oak-----------	---	---	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
81D:										
Grayling	4S	Slight	Moderate	Moderate	Slight	Slight	Jack pine	48	4	Jack pine, red pine.
							Northern pin oak	43	2	
							Quaking aspen	---	---	
							Red pine	---	---	
							White oak	---	---	
81E:										
Grayling	4R	Moderate	Moderate	Moderate	Slight	Slight	Jack pine	48	4	Jack pine, red pine.
							Northern pin oak	43	2	
							Quaking aspen	---	---	
							Red pine	---	---	
							White oak	---	---	
84B:										
Zimmerman	8S	Slight	Moderate	Moderate	Slight	Slight	Jack pine	65	7	Eastern white pine, jack pine, red pine, white spruce.
							Paper birch	---	---	
							Quaking aspen	70	6	
							Red maple	---	---	
							Red pine	64	8	
93B:										
Tacoda	4W	Slight	Severe	Moderate	Moderate	Moderate	Balsam fir	---	---	Eastern white pine, white spruce.
							Eastern white pine	---	---	
							Paper birch	---	---	
							Quaking aspen	60	4	
							Red maple	---	---	
							White ash	---	---	
							White spruce	---	---	
Wakeley	3W	Slight	Severe	Severe	Severe	Severe	Balsam fir	---	---	Eastern arborvitae.
							Black spruce	---	---	
							Eastern arborvitae	---	---	
							Quaking aspen	50	3	
97:										
Colonville	3W	Slight	Severe	Slight	Moderate	Severe	American basswood	65	4	Norway spruce, eastern arborvitae, eastern white pine, northern red oak, white spruce.
							Balsam fir	61	8	
							Eastern arborvitae	45	5	
							Quaking aspen	---	---	
							Red maple	61	3	
							Swamp white oak	66	3	
							White ash	65	4	
100D:										
Curtisville	3A	Slight	Moderate	Slight	Slight	Slight	American basswood	---	---	Norway spruce, eastern white pine, red pine, white spruce.
							American beech	---	---	
							Black cherry	---	---	
							Northern red oak	---	---	
							Quaking aspen	---	---	
							Sugar maple	61	3	
							White ash	---	---	
							White oak	---	---	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
100E:										
Curtisville-----	3R	Moderate	Moderate	Slight	Slight	Slight	American basswood---	---	---	Norway spruce, eastern white pine, red pine, white spruce.
							American beech------	---	---	
							Black cherry--------	---	---	
							Northern red oak----	---	---	
							Quaking aspen-------	---	---	
							Sugar maple---------	61	3	
							White ash-----------	---	---	
							White oak-----------	---	---	
103B:										
Nester----------	3A	Slight	Moderate	Slight	Slight	Slight	American basswood---	---	---	Eastern white pine, red pine, white spruce.
							American beech------	---	---	
							Black cherry--------	---	---	
							Northern red oak----	---	---	
							Quaking aspen-------	---	---	
							Sugar maple---------	66	3	
							White ash-----------	---	---	
							White oak-----------	---	---	
103C:										
Nester----------	3A	Slight	Moderate	Slight	Slight	Slight	American basswood---	---	---	Eastern white pine, red pine, white spruce.
							American beech------	---	---	
							Black cherry--------	---	---	
							Northern red oak----	---	---	
							Quaking aspen-------	---	---	
							Sugar maple---------	66	3	
							White ash-----------	---	---	
							White oak-----------	---	---	
108B:										
Selkirk---------	4C	Slight	Severe	Moderate	Severe	Severe	Balsam fir----------	---	---	Eastern arborvitae, eastern white pine, white spruce.
							Eastern hemlock-----	45	6	
							Quaking aspen-------	58	4	
							Red maple-----------	---	---	
							Sugar maple---------	---	---	
							White spruce--------	---	---	
114A:										
Ingalls---------	4W	Slight	Severe	Moderate	Severe	Severe	Balsam fir----------	---	---	Eastern arborvitae, eastern white pine, white ash, white spruce.
							Eastern arborvitae--	---	---	
							Eastern hemlock-----	---	---	
							Jack pine-----------	---	---	
							Northern pin oak----	---	---	
							Paper birch---------	---	---	
							Quaking aspen-------	60	4	
							Red maple-----------	---	---	
							Sugar maple---------	---	---	
							White ash-----------	---	---	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
120B:										
Morganlake	6A	Slight	Moderate	Moderate	Slight	Slight	American basswood	---	---	Eastern white pine, red pine, white spruce.
							Balsam fir	---	---	
							Bigtooth aspen	76	6	
							Black cherry	---	---	
							Northern red oak	63	4	
							Paper birch	---	---	
							Quaking aspen	74	6	
							Red pine	62	8	
							Sugar maple	---	---	
							Yellow birch	---	---	
120C:										
Morganlake	6A	Slight	Moderate	Moderate	Slight	Slight	American basswood	---	---	Eastern white pine, red pine, white spruce.
							Balsam fir	---	---	
							Bigtooth aspen	76	6	
							Black cherry	---	---	
							Northern red oak	63	4	
							Paper birch	---	---	
							Quaking aspen	74	6	
							Red pine	62	8	
							Sugar maple	---	---	
							Yellow birch	---	---	
123D:										
Klacking	6S	Slight	Moderate	Moderate	Slight	Slight	Bigtooth aspen	70	6	Eastern white pine, red pine.
							Black cherry	---	---	
							Jack pine	---	---	
							Northern pin oak	---	---	
							Northern red oak	60	4	
							Quaking aspen	---	---	
							Red maple	---	---	
							Red pine	---	---	
							White oak	57	3	
124:										
Evart	2W	Slight	Severe	Severe	Severe	Severe	Balsam fir	40	5	Black spruce, tamarack.
							Black spruce	15	2	
							Eastern arborvitae	15	2	
							Quaking aspen	45	2	
							Red maple	40	2	
							Swamp white oak	---	---	
							Tamarack	35	2	
127:										
Cathro	5W	Slight	Severe	Severe	Severe	Severe	Balsam fir	40	5	White spruce.
							Black spruce	15	2	
							Eastern arborvitae	15	2	
							Paper birch	---	---	
							Red maple	40	2	
							Tamarack	35	2	
							White spruce	---	---	
128:										
Dawson	2W	Slight	Severe	Severe	Severe	Severe	Black spruce	15	2	---
							Tamarack	---	---	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordi- nation symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equip- ment limita- tion	Seedling mortal- ity	Wind- throw hazard	Plant competi- tion	Common trees	Site index	Produc- tivity class*	
159A:										
Finch-----------	4W	Slight	Severe	Moderate	Severe	Severe	Black spruce--------	38	3	Eastern white pine, red pine, white spruce.
							Eastern white pine--	53	7	
							Jack pine-----------	52	5	
							Northern red oak----	56	3	
							Paper birch---------	54	4	
							Quaking aspen-------	56	4	
							Red maple-----------	56	2	
197A:										
Gladwin---------	5W	Slight	Severe	Moderate	Severe	Severe	Balsam fir----------	---	---	Eastern white pine, white spruce.
							Bigtooth aspen------	---	---	
							Eastern white pine--	55	7	
							Paper birch---------	69	6	
							Quaking aspen-------	68	5	
							Red maple-----------	---	---	
							White oak-----------	55	3	
							White spruce--------	---	---	
209B:										
Grayling--------	4S	Slight	Moderate	Moderate	Slight	Slight	Jack pine-----------	48	4	Jack pine, red pine.
							Northern pin oak----	43	2	
							Quaking aspen-------	---	---	
							Red pine------------	---	---	
							White oak-----------	---	---	
209C:										
Grayling--------	4S	Slight	Moderate	Moderate	Slight	Slight	Jack pine-----------	48	4	Jack pine, red pine.
							Northern pin oak----	43	2	
							Quaking aspen-------	---	---	
							Red pine------------	---	---	
							White oak-----------	---	---	
209D:										
Grayling--------	4S	Slight	Moderate	Moderate	Slight	Slight	Jack pine-----------	48	4	Jack pine, red pine.
							Northern pin oak----	43	2	
							Quaking aspen-------	---	---	
							Red pine------------	---	---	
							White oak-----------	---	---	
210B:										
Grayling--------	4S	Slight	Moderate	Moderate	Slight	Slight	Jack pine-----------	48	4	Jack pine, red pine.
							Northern pin oak----	43	2	
							Quaking aspen-------	---	---	
							Red pine------------	---	---	
							White oak-----------	---	---	
210C:										
Grayling--------	4S	Slight	Moderate	Moderate	Slight	Slight	Jack pine-----------	48	4	Jack pine, red pine.
							Northern pin oak----	43	2	
							Quaking aspen-------	---	---	
							Red pine------------	---	---	
							White oak-----------	---	---	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordi-nation symbol	Management concerns: Erosion hazard	Equip-ment limita-tion	Seedling mortal-ity	Wind-throw hazard	Plant competi-tion	Potential productivity: Common trees	Site index	Produc-tivity class*	Trees to plant
210D:										
Grayling--------	4R	Moderate	Moderate	Moderate	Slight	Slight	Jack pine-----------	48	4	Jack pine, red pine.
							Northern pin oak----	43	2	
							Quaking aspen-------	---	---	
							Red pine------------	---	---	
							White oak-----------	---	---	
210E:										
Grayling--------	4R	Severe	Severe	Moderate	Slight	Slight	Jack pine-----------	48	4	Jack pine, red pine.
							Northern pin oak----	43	2	
							Quaking aspen-------	---	---	
							Red pine------------	---	---	
							White oak-----------	---	---	
211B:										
Grayling--------	4S	Slight	Moderate	Moderate	Slight	Slight	Jack pine-----------	48	4	---
							Northern pin oak----	43	2	
							Quaking aspen-------	---	---	
							Red pine------------	---	---	
212B:										
Grayling--------	4S	Slight	Moderate	Moderate	Slight	Slight	Jack pine-----------	48	4	Jack pine, red pine.
							Northern pin oak----	43	2	
213B:										
Graycalm--------	6S	Slight	Moderate	Moderare	Slight	Slight	Bigtooth aspen------	70	6	Eastern white pine, red pine.
							Eastern white pine--	---	---	
							Jack pine-----------	56	6	
							Northern red oak----	62	4	
							Paper birch---------	---	---	
							Quaking aspen-------	60	4	
							Red pine------------	61	7	
214B:										
Typic Udipsamments---	3S	Slight	Moderate	Moderate	Slight	---	Black oak-----------	56	3	Red pine.
							Northern red oak----	55	3	
							White oak-----------	49	2	
215B, 216B, 220B:										
Typic Udipsamments---	---	Slight	Moderate	Moderate	Slight	---	--------------------	---	---	---
220D:										
Typic Udipsamments---	---	Moderate	Moderate	Moderate	Slight	---	--------------------	---	---	---
220E:										
Typic Udipsamments---	---	Severe	Severe	Moderate	Slight	---	--------------------	---	---	---
221B, 221C:										
Typic Udipsamments---	---	Slight	Moderate	Moderate	Slight	---	--------------------	---	---	---

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
221D:										
Typic Udipsamments	---	Moderate	Moderate	Moderate	Slight	---	--------------------	---	---	---
221E:										
Typic Udipsamments	---	Severe	Severe	Moderate	Slight	---	--------------------	---	---	---
222B:										
Typic Udipsamments	---	Slight	Moderate	Moderate	Slight	---	--------------------	---	---	---
223B:										
Graycalm	6S	Slight	Moderate	Moderate	Slight	Slight	Bigtooth aspen	70	6	Eastern white pine, red pine.
							Eastern white pine	---	---	
							Jack pine	56	6	
							Northern red oak	62	4	
							Paper birch	---	---	
							Quaking aspen	60	4	
							Red pine	61	7	
Grayling	4S	Slight	Moderate	Moderate	Slight	Slight	Jack pine	48	4	Jack pine, red pine.
							Northern pin oak	43	2	
							Quaking aspen	---	---	
							Red pine	---	---	
							White oak	---	---	
223C:										
Graycalm	6S	Slight	Moderate	Moderate	Slight	Slight	Bigtooth aspen	70	6	Eastern white pine, red pine.
							Eastern white pine	---	---	
							Jack pine	56	6	
							Northern red oak	62	4	
							Paper birch	---	---	
							Quaking aspen	60	4	
							Red pine	61	7	
Grayling	4S	Slight	Moderate	Moderate	Slight	Slight	Jack pine	48	4	Jack pine, red pine.
							Northern pin oak	43	2	
							Quaking aspen	---	---	
							Red pine	---	---	
							White oak	---	---	
223D:										
Graycalm	6S	Slight	Moderate	Moderate	Slight	Slight	Bigtooth aspen	70	6	---
							Eastern white pine	---	---	
							Jack pine	56	6	
							Northern red oak	62	4	
							Paper birch	---	---	
							Quaking aspen	60	4	
							Red pine	61	7	
Grayling	4R	Moderate	Moderate	Moderate	Slight	Slight	Jack pine	48	4	Jack pine, red pine.
							Northern pin oak	43	2	
							Quaking aspen	---	---	
							Red pine	---	---	
							White oak	---	---	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
223E:										
Graycalm--------	6R	Severe	Severe	Moderate	Slight	Slight	Bigtooth aspen------	70	6	Eastern white pine, red pine.
							Eastern white pine--	---	---	
							Jack pine-----------	56	6	
							Northern red oak----	62	4	
							Paper birch---------	---	---	
							Quaking aspen-------	60	4	
							Red pine------------	61	7	
Grayling--------	4R	Severe	Severe	Moderate	Slight	Slight	Jack pine-----------	48	4	Jack pine, red pine.
							Northern pin oak----	43	2	
							Quaking aspen-------	---	---	
							Red pine------------	---	---	
							White oak-----------	---	---	
224B:										
Croswell--------	5S	Slight	Moderate	Moderate	Moderate	Moderate	Bigtooth aspen------	69	6	Eastern white pine, red pine, white spruce.
							Black cherry--------	---	---	
							Eastern white pine--	---	---	
							Jack pine-----------	53	5	
							Northern red oak----	---	---	
							Paper birch---------	54	4	
							Quaking aspen-------	68	5	
							Red maple-----------	---	---	
							Red pine------------	55	6	
225B, 225C:										
Entic Haplorthods----	---	Slight	Moderate	Moderate	Slight	---	--------------------	---	---	---
231D:										
Entic Haplorthods----	---	Moderate	Moderate	Moderate	Slight	---	--------------------	---	---	---
Alfic Haplorthods----	---	Moderate	Moderate	Slight	Slight	---	--------------------	---	---	---
231E:										
Entic Haplorthods----	---	Severe	Severe	Moderate	Slight	---	--------------------	---	---	---
Alfic Haplorthods----	---	Severe	Severe	Slight	Slight	---	--------------------	---	---	---
232B:										
Entic Haplorthods----	---	Slight	Moderate	Moderate	Slight	---	--------------------	---	---	---
Alfic Haplorthods----	---	Slight	Slight	Slight	Slight	---	--------------------	---	---	---
233B:										
Alfic Haplorthods----	---	Slight	Slight	Slight	Slight	---	--------------------	---	---	---
Entic Haplorthods----	---	Slight	Moderate	Moderate	Slight	---	--------------------	---	---	---

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
233C:										
Alfic Haplorthods	---	Slight	Slight	Slight	Slight	---	---	---	---	---
Entic Haplorthods	---	Slight	Moderate	Moderate	Slight	---	---	---	---	---
233D:										
Alfic Haplorthods	---	Moderate	Moderate	Slight	Slight	---	---	---	---	---
Entic Haplorthods	---	Moderate	Moderate	Moderate	Slight	---	---	---	---	---
235B, 235C:										
Alfic Haplorthods, sandy over loamy	---	Slight	Moderate	Moderate	Slight	---	---	---	---	---
Alfic Haplorthods, sandy	---	Slight	Slight	Slight	Slight	---	---	---	---	---
236B:										
Arenic Eutroboralfs	---	Slight	Slight	Slight	Slight	---	---	---	---	---
254A:										
Borosaprists.										
Fluvaquents.										
Aquic Udipsamments	4S	Slight	Moderate	Moderate	Slight	Moderate	Balsam fir	---	---	---
							Northern red oak	65	4	
							Red maple	---	---	
262A:										
Au Gres	6W	Slight	Severe	Moderate	Severe	Severe	Balsam fir	---	---	Norway spruce, eastern white pine, red pine, white spruce.
							Bigtooth aspen	---	---	
							Eastern arborvitae	---	---	
							Eastern hemlock	---	---	
							Eastern white pine	---	---	
							Jack pine	51	5	
							Paper birch	---	---	
							Quaking aspen	70	6	
							Red maple	65	3	
							Yellow birch	---	---	
264A:										
Allendale	4W	Slight	Severe	Slight	Moderate	Moderate	Balsam fir	---	---	Eastern white pine, white spruce.
							Eastern white pine	---	---	
							Paper birch	---	---	
							Quaking aspen	60	4	
							Red maple	---	---	
							White ash	---	---	
							White spruce	---	---	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordi-nation symbol	Management concerns: Erosion hazard	Equip-ment limita-tion	Seedling mortal-ity	Wind-throw hazard	Plant competi-tion	Potential productivity: Common trees	Site index	Produc-tivity class*	Trees to plant
265B:										
Eutroboralfs.										
Allendale	4W	Slight	Severe	Slight	Moderate	Moderate	Balsam fir	---	---	Eastern white pine, white spruce.
							Eastern white pine	---	---	
							Paper birch	---	---	
							Quaking aspen	60	4	
							Red maple	---	---	
							White ash	---	---	
							White spruce	---	---	
266A:										
Typic Duraquods	4W	Slight	Severe	Moderate	Severe	Severe	Black spruce	---	---	Eastern white pine, red pine, white spruce.
							Eastern white pine	---	---	
							Northern red oak	---	---	
							Paper birch	---	---	
							Quaking aspen	56	4	
							Red maple	---	---	
272:										
Endoaquods	---	Slight	Severe	Severe	Severe	---	-------------------	---	---	---
Fluvaquents.										
273:										
Leafriver	2W	Slight	Severe	Severe	Severe	Severe	Black spruce	---	---	---
							Eastern arborvitae	---	---	
							Quaking aspen	45	2	
							Tamarack	---	---	
Wakeley	3W	Slight	Severe	Severe	Severe	Severe	Balsam fir	---	---	Eastern arborvitae.
							Black spruce	---	---	
							Eastern arborvitae	---	---	
							Quaking aspen	50	3	
274:										
Typic Endoaquods	---	Slight	Severe	Severe	Severe	---	-------------------	---	---	---
281:										
Borosaprists	---	Slight	Severe	Severe	Severe	Severe	Black spruce	---	---	---
343:										
Sims	4W	Slight	Severe	Severe	Severe	Severe	American basswood	---	---	---
							Balsam fir	---	---	
							Bigtooth aspen	57	4	
							Black spruce	---	---	
							Eastern arborvitae	---	---	
							Quaking aspen	---	---	
							White ash	---	---	
355E:										
Crowell	7R	Moderate	Moderate	Moderate	Slight	Slight	Bigtooth aspen	---	---	Red pine.
							Eastern white pine	---	---	
							Northern red oak	---	---	
							Red maple	---	---	
							Red pine	59	7	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
355E:										
Proper	5W	Slight	Moderate	Moderate	Slight	Moderate	Jack pine	---	---	Eastern white pine, white spruce.
							Quaking aspen	65	5	
							Red maple	---	---	
							Red pine	---	---	
356E:										
Aquepts.										
Histosols.										
Fluvaquents	---	Slight	Severe	Severe	Severe	Severe	---	---	---	---
360:										
Wakeley	3W	Slight	Severe	Severe	Severe	Severe	Balsam fir	---	---	Eastern arborvitae.
							Black spruce	---	---	
							Eastern arborvitae	---	---	
							Quaking aspen	50	3	
367A:										
Whittemore	4W	Slight	Severe	Moderate	Severe	Severe	---	---	---	---
Springport	6W	Slight	Severe	Severe	Severe	Severe	Balsam fir	45	6	Eastern arborvitae, eastern white pine, white spruce.
							Balsam poplar	---	---	
							Black ash	---	---	
							Eastern arborvitae	---	---	
							Paper birch	---	---	
							Quaking aspen	---	---	
368A:										
Au Gres	6W	Slight	Severe	Moderate	Severe	Severe	Balsam fir	---	---	Norway spruce, eastern white pine, red pine, white spruce.
							Bigtooth aspen	---	---	
							Eastern arborvitae	---	---	
							Eastern hemlock	---	---	
							Eastern white pine	---	---	
							Jack pine	51	5	
							Paper birch	---	---	
							Quaking aspen	70	6	
							Red maple	65	3	
							Yellow birch	---	---	
Deford	4W	Slight	Severe	Severe	Severe	Severe	American basswood	---	---	Eastern white pine, white spruce.
							Balsam fir	---	---	
							Eastern arborvitae	---	---	
							Quaking aspen	60	4	
							Red maple	64	3	
369:										
Deford	4W	Slight	Severe	Severe	Severe	Severe	American basswood	---	---	Eastern white pine, white spruce.
							Balsam fir	---	---	
							Eastern arborvitae	---	---	
							Quaking aspen	60	4	
							Red maple	64	3	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
370A:										
McIvor	2W	Slight	Severe	Moderate	Severe	Severe	Jack pine	---	---	Eastern white pine, red pine, white spruce.
							Paper birch	---	---	
							Quaking aspen	---	---	
							Red maple	56	2	
							Red pine	---	---	
371:										
Springport	6W	Slight	Severe	Severe	Severe	Severe	Balsam fir	45	6	Eastern arborvitae, eastern white pine, white spruce.
							Balsam poplar	---	---	
							Black ash	---	---	
							Eastern arborvitae	---	---	
							Paper birch	---	---	
							Quaking aspen	---	---	
372B:										
Proper	5W	Slight	Moderate	Moderate	Slight	Moderate	Jack pine	---	---	Eastern white pine, red pine, white spruce.
							Quaking aspen	65	5	
							Red maple	---	---	
							Red pine	---	---	
Leafriver	2W	Slight	Severe	Severe	Severe	Severe	Black spruce	---	---	---
							Eastern arborvitae	---	---	
							Quaking aspen	45	2	
							Tamarack	---	---	
375:										
Kanotin	3W	Slight	Severe	Severe	Severe	Severe	Balsam fir	---	---	---
							Black spruce	39	3	
							Jack pine	---	---	
							Tamarack	---	---	
377:										
Wabun	3W	Slight	Severe	Severe	Severe	Severe	---	---	---	---
378A:										
Algonquin	6W	Slight	Severe	Moderate	Severe	Severe	Balsam fir	45	6	Eastern arborvitae, eastern white pine, white spruce.
							Balsam poplar	---	---	
							Black ash	---	---	
							Eastern arborvitae	---	---	
							Paper birch	---	---	
							Quaking aspen	---	---	
							Red maple	---	---	
379A:										
Algonquin	6W	Slight	Severe	Moderate	Severe	Severe	Balsam fir	45	6	Eastern arborvitae, eastern white pine, white spruce.
							Balsam poplar	---	---	
							Black ash	---	---	
							Eastern arborvitae	---	---	
							Paper birch	---	---	
							Quaking aspen	---	---	
							Red maple	---	---	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Productivity class*	Trees to plant
379A:										
Springport	6W	Slight	Severe	Severe	Severe	Severe	Balsam fir	45	6	Eastern arborvitae, eastern white pine, white spruce.
							Balsam poplar	---	---	
							Black ash	---	---	
							Eastern arborvitae	---	---	
							Paper birch	---	---	
							Quaking aspen	---	---	
381A:										
McIvor	2W	Slight	Severe	Moderate	Severe	Severe	Jack pine	---	---	Eastern white pine, red pine, white spruce.
							Paper birch	---	---	
							Quaking aspen	---	---	
							Red maple	56	2	
							Red pine	---	---	
Wakeley	3W	Slight	Severe	Severe	Severe	Severe	Balsam fir	---	---	Eastern arborvitae.
							Black spruce	---	---	
							Eastern arborvitae	---	---	
							Quaking aspen	50	3	
382B:										
Proper	5W	Slight	Moderate	Moderate	Slight	Moderate	Jack pine	---	---	Eastern white pine, red pine, white spruce.
							Quaking aspen	65	5	
							Red maple	---	---	
							Red pine	---	---	
383B:										
Wurtsmith	6S	Slight	Moderate	Moderate	Moderate	Moderate	Bigtooth aspen	69	6	Jack pine, red pine.
							Black oak	---	---	
							Jack pine	---	---	
							Red maple	---	---	
392:										
Caffey	2W	Slight	Severe	Severe	Severe	Severe	Balsam fir	---	---	---
							Bigtooth aspen	---	---	
							Black ash	---	---	
							Eastern arborvitae	---	---	
							Paper birch	---	---	
							Quaking aspen	40	2	
							Red maple	---	---	
403B:										
Iargo	3	Slight	Moderate	Slight	Moderate	Moderate	American basswood	---	---	Eastern white pine, white spruce.
							Paper birch	---	---	
							Sugar maple	63	3	
403C:										
Iargo	3	Slight	Moderate	Slight	Moderate	Moderate	American basswood	---	---	Eastern white pine, white spruce.
							Paper birch	---	---	
							Sugar maple	63	3	
404A:										
Manary	4C	Slight	Severe	Slight	Moderate	Moderate	---	---	---	---

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordi- nation symbol	Management concerns: Erosion hazard	Equip- ment limita- tion	Seedling mortal- ity	Wind- throw hazard	Plant competi- tion	Potential productivity: Common trees	Site index	Produc- tivity class*	Trees to plant
405B:										
Manary----------	4C	Slight	Severe	Slight	Moderate	Moderate	--------------------	---	---	---
Iargo-----------	3	Slight	Moderate	Slight	Moderate	Moderate	American basswood---	---	---	Eastern white pine, white spruce.
							Paper birch---------	---	---	
							Sugar maple---------	63	3	
406A:										
Winterfield-----	6W	Slight	Severe	Moderate	Severe	Severe	Balsam fir----------	---	---	Eastern arborvitae, eastern white pine, white spruce.
							Black spruce--------	---	---	
							Eastern white pine--	---	---	
							Quaking aspen-------	70	6	
							Red maple-----------	65	3	
							Sugar maple---------	---	---	
							White ash-----------	---	---	
							White spruce--------	---	---	
							Yellow birch--------	---	---	
407:										
Lacota----------	2W	Slight	Severe	Severe	Severe	Severe	American basswood---	---	---	Norway spruce, eastern white pine, green ash, white spruce.
							Black oak-----------	---	---	
							Northern red oak----	---	---	
							Red maple-----------	56	2	
							White ash-----------	---	---	
408:										
Sims------------	4W	Slight	Severe	Severe	Severe	Severe	American basswood---	---	---	---
							Balsam fir----------	---	---	
							Bigtooth aspen------	57	4	
							Black spruce--------	---	---	
							Eastern arborvitae--	---	---	
							Quaking aspen-------	---	---	
							White ash-----------	---	---	
409A:										
Finch-----------	4W	Slight	Severe	Moderate	Severe	Severe	Black spruce--------	38	3	Eastern white pine, red pine, white spruce.
							Eastern white pine--	53	7	
							Jack pine-----------	52	5	
							Northern red oak----	56	3	
							Paper birch---------	54	4	
							Quaking aspen-------	56	4	
							Red maple-----------	56	2	
Deford----------	4W	Slight	Severe	Severe	Severe	Severe	American basswood---	---	---	Eastern white pine, white spruce.
							Balsam fir----------	---	---	
							Eastern arborvitae--	---	---	
							Quaking aspen-------	60	4	
							Red maple-----------	64	3	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
409A:										
Au Gres	6W	Slight	Severe	Moderate	Severe	Severe	Balsam fir	---	---	Norway spruce, eastern white pine, red pine, white spruce.
							Bigtooth aspen	---	---	
							Eastern arborvitae	---	---	
							Eastern hemlock	---	---	
							Eastern white pine	---	---	
							Jack pine	51	5	
							Paper birch	---	---	
							Quaking aspen	70	6	
							Red maple	65	3	
							Yellow birch	---	---	
410B:										
Proper	5W	Slight	Moderate	Moderate	Slight	Moderate	Jack pine	---	---	Eastern white pine, red pine, white spruce.
							Quaking aspen	65	5	
							Red maple	---	---	
							Red pine	---	---	
Finch	4W	Slight	Severe	Moderate	Severe	Severe	Black spruce	38	3	Eastern white pine, red pine, white spruce.
							Eastern white pine	53	7	
							Jack pine	52	5	
							Northern red oak	56	3	
							Paper birch	54	4	
							Quaking aspen	56	4	
							Red maple	56	2	
Deford	4W	Slight	Severe	Severe	Severe	Severe	American basswood	---	---	Eastern white pine, white spruce.
							Balsam fir	---	---	
							Eastern arborvitae	---	---	
							Quaking aspen	60	4	
							Red maple	64	3	
411A:										
Meehan	5W	Slight	Moderate	Slight	Moderate	Moderate	Balsam fir	---	---	Balsam fir, eastern white pine, jack pine, red maple, red pine, white spruce.
							Black spruce	---	---	
							Eastern white pine	62	9	
							Jack pine	55	5	
							Northern pin oak	60	3	
							Paper birch	---	---	
							Quaking aspen	---	---	
							Red pine	50	5	
							White spruce	---	---	
425D:										
Hottis	3C	Slight	Severe	Slight	Moderate	Moderate	American beech	---	---	Eastern white pine, white spruce.
							American elm	---	---	
							Eastern hemlock	---	---	
							Eastern white pine	---	---	
							Northern red oak	57	3	
							Sugar maple	---	---	
426B:										
Coppler	3A	Slight	Slight	Slight	Slight	Moderate	Eastern white pine	---	---	Eastern white pine, red pine.
							Northern red oak	55	3	
							Paper birch	---	---	
							Quaking aspen	66	5	
							Red maple	---	---	
							Red pine	---	---	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
426C:										
Coppler	3A	Slight	Slight	Slight	Slight	Moderate	Eastern white pine	---	---	Eastern white pine, red pine.
							Northern red oak	55	3	
							Paper birch	---	---	
							Quaking aspen	66	5	
							Red maple	---	---	
							Red pine	---	---	
427:										
Tonkey	5W	Slight	Severe	Severe	Severe	Severe	American basswood	55	3	---
							American elm	---	---	
							Balsam fir	---	---	
							Eastern arborvitae	---	---	
							Quaking aspen	61	5	
							Red maple	---	---	
							Swamp white oak	---	---	
429D:										
Menominee	6S	Slight	Moderate	Moderate	Slight	Moderate	American basswood	---	---	White spruce.
							Bigtooth aspen	76	6	
							Black cherry	---	---	
							Northern red oak	63	4	
							Paper birch	---	---	
							Quaking aspen	74	6	
							Red pine	62	8	
							Sugar maple	---	---	
							White ash	77	5	
							White oak	77	5	
430D:										
Mongo	3R	Moderate	Moderate	Slight	Moderate	Severe	American beech	---	---	Eastern white pine, white spruce.
							Balsam fir	---	---	
							Bigtooth aspen	---	---	
							Eastern hemlock	---	---	
							Northern red oak	---	---	
							Sugar maple	62	3	
							White ash	---	---	
430E:										
Mongo	3R	Moderate	Moderate	Slight	Moderate	Severe	American beech	---	---	Eastern white pine, white spruce.
							Balsam fir	---	---	
							Bigtooth aspen	---	---	
							Eastern hemlock	---	---	
							Northern red oak	---	---	
							Sugar maple	62	3	
							White ash	---	---	
431B:										
Skeel	3S	Slight	Moderate	Moderate	Slight	Slight	Bigtooth aspen	---	---	Red pine, white spruce.
							Paper birch	---	---	
							Red maple	65	3	
							White oak	---	---	
432B:										
Wurtsmith	6S	Slight	Moderate	Moderate	Moderate	Moderate	Bigtooth aspen	69	6	Jack pine, red pine.
							Black oak	---	---	
							Jack pine	---	---	
							Red maple	---	---	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Productivity class*	Trees to plant
432B:										
Meehan----------	5W	Slight	Moderate	Slight	Moderate	Moderate	Balsam fir----------	---	---	Balsam fir, eastern white pine, jack pine, red maple, red pine, white spruce.
							Black spruce--------	---	---	
							Eastern white pine--	62	9	
							Jack pine-----------	55	5	
							Northern pin oak----	60	3	
							Paper birch---------	---	---	
							Quaking aspen-------	---	---	
							Red pine------------	50	5	
							White spruce--------	---	---	
433B:										
Morganlake------	6A	Slight	Moderate	Moderate	Slight	Moderate	American basswood---	---	---	Eastern white pine, red pine, white spruce.
							Balsam fir----------	---	---	
							Bigtooth aspen------	76	6	
							Black cherry--------	---	---	
							Northern red oak----	63	4	
							Paper birch---------	---	---	
							Quaking aspen-------	74	6	
							Red pine------------	62	8	
							Sugar maple---------	---	---	
							Yellow birch--------	---	---	
Graycalm--------	6S-	Slight	Moderate	Moderate	Slight	Slight	Bigtooth aspen------	70	6	Eastern white pine, red pine.
							Eastern white pine--	---	---	
							Jack pine-----------	56	6	
							Northern red oak----	62	4	
							Paper birch---------	---	---	
							Quaking aspen-------	60	4	
							Red pine------------	61	7	
434D:										
Graycalm--------	6S	Slight	Moderate	Moderate	Slight	Slight	Bigtooth aspen------	70	6	Eastern white pine, red pine.
							Eastern white pine--	---	---	
							Jack pine-----------	56	6	
							Northern red oak----	62	4	
							Paper birch---------	---	---	
							Quaking aspen-------	60	4	
							Red pine------------	61	7	
Menominee-------	6S	Slight	Moderate	Moderate	Slight	Moderate	American basswood---	---	---	White spruce.
							Bigtooth aspen------	76	6	
							Black cherry--------	---	---	
							Northern red oak----	63	4	
							Paper birch---------	---	---	
							Quaking aspen-------	74	6	
							Red pine------------	62	8	
							Sugar maple---------	---	---	
							White ash-----------	77	5	
							White oak-----------	77	5	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
434D:										
Morganlake	6A	Slight	Moderate	Moderate	Slight	Moderate	American basswood	---	---	Eastern white pine, red pine, white spruce.
							Balsam fir	---	---	
							Bigtooth aspen	76	6	
							Black cherry	---	---	
							Northern red oak	63	4	
							Paper birch	---	---	
							Quaking aspen	74	6	
							Red pine	62	8	
							Sugar maple	---	---	
							Yellow birch	---	---	
435B:										
Skeel	3S	Slight	Moderate	Moderate	Slight	Slight	Bigtooth aspen	---	---	Red pine, white spruce.
							Paper birch	---	---	
							Red maple	65	3	
							White oak	---	---	
Algonquin	6W	Slight	Severe	Moderate	Severe	Severe	Balsam fir	45	6	Eastern arborvitae, eastern white pine, white spruce.
							Balsam poplar	---	---	
							Black ash	---	---	
							Eastern arborvitae	---	---	
							Paper birch	---	---	
							Quaking aspen	---	---	
							Red maple	---	---	
Aquepts	---	Slight	Severe	Severe	Severe	Severe	---	---	---	---
436A:										
Manary	4C	Slight	Severe	Slight	Moderate	Moderate	---	---	---	---
Whittemore	4W	Slight	Severe	Moderate	Severe	Severe	---	---	---	---
Springport	6W	Slight	Severe	Severe	Severe	Severe	Balsam fir	45	6	Eastern arborvitae, eastern white pine, white spruce.
							Balsam poplar	---	---	
							Black ash	---	---	
							Eastern arborvitae	---	---	
							Paper birch	---	---	
							Quaking aspen	---	---	
437D:										
Wurtsmith	6S	Slight	Moderate	Moderate	Moderate	Moderate	Bigtooth aspen	69	6	Jack pine, red pine.
							Black oak	---	---	
							Jack pine	---	---	
							Red maple	---	---	
Meehan	5W	Slight	Moderate	Slight	Moderate	Moderate	Balsam fir	---	---	Balsam fir, eastern white pine, jack pine, red maple, red pine, white spruce.
							Black spruce	---	---	
							Eastern white pine	62	9	
							Jack pine	55	5	
							Northern pin oak	60	3	
							Paper birch	---	---	
							Quaking aspen	---	---	
							Red pine	50	5	
							White spruce	---	---	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
437D:										
Deer Park	4S	Slight	Moderate	Moderate	Slight	Slight	American beech	---	---	Jack pine, red pine.
							Black cherry	---	---	
							Eastern white pine	---	---	
							Jack pine	46	4	
							Northern red oak	---	---	
							Paper birch	---	---	
							Quaking aspen	---	---	
							Red pine	45	4	
438C:										
Meehan	5W	Slight	Moderate	Slight	Moderate	Moderate	Balsam fir	---	---	Balsam fir, eastern white pine, jack pine, red maple, red pine, white spruce.
							Black spruce	---	---	
							Eastern white pine	62	9	
							Jack pine	55	5	
							Northern pin oak	60	3	
							Paper birch	---	---	
							Quaking aspen	---	---	
							Red pine	50	5	
							White spruce	---	---	
Tawas	5W	Slight	Severe	Severe	Severe	Severe	Balsam fir	40	5	---
							Black ash	---	---	
							Eastern arborvitae	---	---	
							Quaking aspen	---	---	
							Red maple	---	---	
Wurtsmith	6S	Slight	Moderate	Moderate	Moderate	Moderate	Bigtooth aspen	69	6	Jack pine, red pine.
							Black oak	---	---	
							Jack pine	---	---	
							Red maple	---	---	
439D:										
Deer Park	4S	Slight	Moderate	Moderate	Slight	Slight	American beech	---	---	Jack pine, red pine.
							Black cherry	---	---	
							Eastern white pine	---	---	
							Jack pine	46	4	
							Northern red oak	---	---	
							Paper birch	---	---	
							Quaking aspen	---	---	
							Red pine	45	4	
440B:										
Kawkawlin	3W	Slight	Severe	Slight	Moderate	Severe	American basswood	---	---	Norway spruce, eastern white pine, red pine, white spruce.
							Bigtooth aspen	---	---	
							Northern red oak	---	---	
							Quaking aspen	---	---	
							Red maple	---	---	
							Sugar maple	60	3	
							Swamp white oak	---	---	
							White ash	---	---	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordi-nation symbol	Management concerns: Erosion hazard	Equip-ment limita-tion	Seedling mortal-ity	Wind-throw hazard	Plant competi-tion	Potential productivity: Common trees	Site index	Produc-tivity class*	Trees to plant
440B:										
Sims------------	4W	Slight	Severe	Severe	Severe	Severe	American basswood---	---	---	---
							Balsam fir----------	---	---	
							Bigtooth aspen------	57	4	
							Black spruce--------	---	---	
							Eastern arborvitae--	---	---	
							Quaking aspen-------	---	---	
							White ash-----------	---	---	
441B:										
Morganlake------	6A	Slight	Moderate	Moderate	Slight	Moderate	American basswood---	---	---	Eastern white pine, red pine, white spruce.
							Balsam fir----------	---	---	
							Bigtooth aspen------	76	6	
							Black cherry--------	---	---	
							Northern red oak----	63	4	
							Paper birch---------	---	---	
							Quaking aspen-------	74	6	
							Red pine------------	62	8	
							Sugar maple---------	---	---	
							Yellow birch--------	---	---	
Nester----------	3A	Slight	Moderate	Slight	Slight	Moderate	American basswood---	---	---	Eastern white pine, red pine, white spruce.
							American beech------	---	---	
							Black cherry--------	---	---	
							Northern red oak----	---	---	
							Quaking aspen-------	---	---	
							Sugar maple---------	66	3	
							White ash-----------	---	---	
							White oak-----------	---	---	
441C:										
Morganlake------	6A	Slight	Moderate	Moderate	Slight	Moderate	American basswood---	---	---	Eastern white pine, red pine, white spruce.
							Balsam fir----------	---	---	
							Bigtooth aspen------	76	6	
							Black cherry--------	---	---	
							Northern red oak----	63	4	
							Paper birch---------	---	---	
							Quaking aspen-------	74	6	
							Red pine------------	62	8	
							Sugar maple---------	---	---	
							Yellow birch--------	---	---	
Nester----------	3A	Slight	Moderate	Slight	Slight	Moderate	American basswood---	---	---	Eastern white pine, red pine, white spruce.
							American beech------	---	---	
							Black cherry--------	---	---	
							Northern red oak----	---	---	
							Quaking aspen-------	---	---	
							Sugar maple---------	66	3	
							White ash-----------	---	---	
							White oak-----------	---	---	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
442D: Menominee-------	6S	Slight	Moderate	Moderate	Slight	Moderate	American basswood---	---	---	White spruce.
							Bigtooth aspen------	76	6	
							Black cherry--------	---	---	
							Northern red oak----	63	4	
							Paper birch---------	---	---	
							Quaking aspen-------	74	6	
							Red pine------------	62	8	
							Sugar maple---------	---	---	
							White ash-----------	77	5	
							White oak-----------	77	5	
Curtisville-----	3A	Slight	Moderate	Slight	Slight	Slight	American basswood---	---	---	Norway spruce, eastern white pine, red pine, white spruce.
							American beech------	---	---	
							Black cherry--------	---	---	
							Northern red oak----	---	---	
							Quaking aspen-------	---	---	
							Sugar maple---------	61	3	
							White ash-----------	---	---	
							White oak-----------	---	---	
442E: Menominee-------	5R	Moderate	Moderate	Moderate	Slight	Moderate	American basswood---	---	---	White spruce.
							Bigtooth aspen------	76	6	
							Black cherry--------	---	---	
							Northern red oak----	63	4	
							Paper birch---------	---	---	
							Quaking aspen-------	74	6	
							Red pine------------	62	8	
							Sugar maple---------	---	---	
							White ash-----------	77	5	
							White oak-----------	77	5	
Curtisville-----	3R	Moderate	Moderate	Slight	Slight	Moderate	American basswood---	---	---	Norway spruce, eastern white pine, red pine, white spruce.
							American beech------	---	---	
							Black cherry--------	---	---	
							Northern red oak----	---	---	
							Quaking aspen-------	---	---	
							Sugar maple---------	61	3	
							White ash-----------	---	---	
							White oak-----------	---	---	
443B: Kawkawlin-------	3W	Slight	Severe	Slight	Moderate	Moderate	American basswood---	---	---	Norway spruce, eastern white pine, red pine, white spruce.
							Bigtooth aspen------	---	---	
							Northern red oak----	---	---	
							Quaking aspen-------	---	---	
							Red maple-----------	---	---	
							Sugar maple---------	60	3	
							Swamp white oak-----	---	---	
							White ash-----------	---	---	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
443B:										
Allendale	4W	Slight	Severe	Slight	Moderate	Moderate	Balsam fir	---	---	Eastern white pine, white spruce.
							Eastern white pine	---	---	
							Paper birch	---	---	
							Quaking aspen	60	4	
							Red maple	---	---	
							White ash	---	---	
							White spruce	---	---	
Aquepts	---	Slight	Severe	Severe	Severe	Severe	---	---	---	---
444B:										
Kawkawlin	3W	Slight	Severe	Slight	Moderate	Moderate	American basswood	---	---	Norway spruce, eastern white pine, red pine, white spruce.
							Bigtooth aspen	---	---	
							Northern red oak	---	---	
							Quaking aspen	---	---	
							Red maple	---	---	
							Sugar maple	60	3	
							Swamp white oak	---	---	
							White ash	---	---	
445A:										
Corsair	2W	Slight	Moderate	Slight	Moderate	Moderate	Bigtooth aspen	---	---	Eastern arborvitae, eastern white pine, white spruce.
							Black ash	---	---	
							Quaking aspen	40	2	
							Red maple	---	---	
446B:										
Wurtsmith	6S	Slight	Moderate	Moderate	Moderate	Moderate	Bigtooth aspen	69	6	Jack pine, red pine.
							Black oak	---	---	
							Jack pine	---	---	
							Red maple	---	---	
Meehan	5W	Slight	Moderate	Slight	Moderate	Moderate	Balsam fir	---	---	Balsam fir, eastern white pine, jack pine, red maple, red pine, white spruce.
							Black spruce	---	---	
							Eastern white pine	62	9	
							Jack pine	55	5	
							Northern pin oak	60	3	
							Paper birch	---	---	
							Quaking aspen	---	---	
							Red pine	50	5	
							White spruce	---	---	
Urban land.										
447A:										
Whittemore	4W	Slight	Severe	Moderate	Severe	Severe	---	---	---	---

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Productivity class*	Trees to plant
448A:										
Meehan----------	5W	Slight	Moderate	Slight	Moderate	Moderate	Balsam fir----------	---	---	Balsam fir, eastern white pine, jack pine, red maple, red pine, white spruce.
							Black spruce--------	---	---	
							Eastern white pine--	62	9	
							Jack pine-----------	55	5	
							Northern pin oak----	60	3	
							Paper birch---------	---	---	
							Quaking aspen-------	---	---	
							Red pine------------	50	5	
							White spruce--------	---	---	
Tawas-----------	5W	Slight	Severe	Severe	Severe	Severe	Balsam fir----------	40	5	---
							Black ash-----------	---	---	
							Eastern arborvitae--	---	---	
							Quaking aspen-------	---	---	
							Red maple-----------	---	---	
449A:										
Kokosing--------	2W	Slight	Severe	Moderate	Severe	Severe	Balsam fir----------	---	---	Eastern white pine.
							Eastern white pine--	---	---	
							Paper birch---------	---	---	
							Quaking aspen-------	---	---	
							Red maple-----------	55	2	

* Productivity class is the yield in cubic meters per hectare per year calculated at the age of culmination of the mean annual increment for fully stocked natural stands.

Table 8.--Equipment Limitations on Woodland

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Ratings for most limiting season(s)			Preferred operating season(s)	Ratings for preferred operating season(s)		
	Logging areas and skid roads	Log landings	Haul roads		Logging areas and skid roads	Log landings	Haul roads
12B:							
Tawas	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
Au Gres	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight	Slight	Slight.
13:							
Tawas	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
Lupton	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
15A:							
Croswell	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight	Slight	Slight.
Au Gres	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight	Slight	Slight.
16B Graycalm	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight	Slight	Slight.
16D Graycalm	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy.	Spring, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
17B Croswell	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight	Slight	Slight.
18A Au Gres	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight	Slight	Slight.
19 Leafriver	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight	Slight	Slight.

Table 8.--Equipment Limitations on Woodland--Continued

Soil name and map symbol	Ratings for most limiting season(s)			Preferred operating season(s)	Ratings for preferred operating season(s)		
	Logging areas and skid roads	Log landings	Haul roads		Logging areas and skid roads	Log landings	Haul roads
25B: Kent	Moderate: low strength.	Slight	Slight	Summer, winter	Moderate: too clayey.	Slight	Slight.
25C: Kent	Moderate: low strength.	Moderate: slope.	Slight	Summer, winter	Moderate: too clayey.	Moderate: slope.	Slight.
26B: Cublake	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight	Slight	Slight.
27A: Tacoda	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight	Slight	Slight.
28B: East Lake	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight	Slight	Slight.
39B: Glennie	Moderate: low strength.	Moderate: low strength, slope.	Moderate: low strength.	Summer, fall, winter.	Slight	Slight	Slight.
39C: Glennie	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Summer, fall, winter.	Slight	Moderate: slope.	Slight.
40A: Sprinkler	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight	Slight	Slight.
47D: Graycalm	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy.	Spring, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
47F: Graycalm	Severe: slope.	Severe: slope.	Severe: slope.	Spring, fall, winter.	Severe: slope.	Severe: slope.	Severe: slope.
53B: Negwegon	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.	Slight	Slight	Slight.
53C: Negwegon	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Summer, fall, winter.	Slight	Moderate: slope.	Slight.
54A: Algonquin	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight	Slight	Slight.

Table 8.--Equipment Limitations on Woodland--Continued

Soil name and map symbol	Ratings for most limiting season(s): Logging areas and skid roads	Ratings for most limiting season(s): Log landings	Ratings for most limiting season(s): Haul roads	Preferred operating season(s)	Ratings for preferred operating season(s): Logging areas and skid roads	Ratings for preferred operating season(s): Log landings	Ratings for preferred operating season(s): Haul roads
55---------------- Springport	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight--------	Slight--------	Slight.
56C--------------- Nester	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.	Summer, fall, winter.	Slight--------	Moderate: slope.	Slight.
57B--------------- Kawkawlin	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight--------	Slight--------	Slight.
58A:							
Wakeley-----------	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight--------	Slight--------	Slight.
Allendale---------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight--------	Slight--------	Slight.
59B:							
Algonquin---------	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight--------	Slight--------	Slight.
Springport--------	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight--------	Slight--------	Slight.
62A--------------- Allendale	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight--------	Slight--------	Slight.
70---------------- Lupton	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter---------	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
71---------------- Tawas	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter---------	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
72---------------- Dorval	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter---------	Moderate: low strength.	Severe: low strength.	Moderate: low strength.

Table 8.--Equipment Limitations on Woodland--Continued

Soil name and map symbol	Ratings for most limiting season(s)			Preferred operating season(s)	Ratings for preferred operating season(s)		
	Logging areas and skid roads	Log landings	Haul roads		Logging areas and skid roads	Log landings	Haul roads
75B: Rubicon	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall winter.	Slight	Slight	Slight.
75D: Rubicon	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Spring, fall winter.	Slight	Moderate: slope.	Slight.
75E: Rubicon	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy, slope.	Spring, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
75F: Rubicon	Severe: slope.	Severe: slope.	Severe: slope.	Spring, fall, winter.	Severe: slope.	Severe: slope.	Severe: slope.
77: Rollaway	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter	Slight	Slight	Slight.
81B: Grayling	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight	Slight	Slight.
81C: Grayling	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Spring, fall, winter.	Slight	Moderate: slope.	Slight.
81D: Grayling	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Spring, fall, winter.	Slight	Moderate: slope.	Slight.
81E: Grayling	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy, slope.	Spring, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
84B: Zimmerman	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight	Slight	Slight.
93B:							
Tacoda	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight	Slight	Slight.
Wakeley	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight	Slight	Slight.

Table 8.--Equipment Limitations on Woodland--Continued

Soil name and map symbol	Ratings for most limiting season(s): Logging areas and skid roads	Ratings for most limiting season(s): Log landings	Ratings for most limiting season(s): Haul roads	Preferred operating season(s)	Ratings for preferred operating season(s): Logging areas and skid roads	Ratings for preferred operating season(s): Log landings	Ratings for preferred operating season(s): Haul roads
97-----------------Colonville	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight---------	Slight---------	Slight.
100D---------------Curtisville	Moderate: low strength.	Moderate: slope.	Slight---------	Summer, winter	Slight---------	Moderate: slope.	Slight.
100E---------------Curtisville	Moderate: low strength, slope.	Severe: slope.	Moderate: slope.	Summer, winter	Moderate: slope.	Severe: slope.	Moderate: slope.
103B---------------Nester	Moderate: low strength.	Slight---------	Slight---------	Summer, winter	Slight---------	Slight---------	Slight.
103C---------------Nester	Moderate: low strength.	Moderate: slope.	Slight---------	Summer, winter	Slight---------	Moderate: slope.	Slight.
108B---------------Selkirk	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight---------	Slight---------	Slight.
114A---------------Ingalls	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight---------	Slight---------	Slight.
120B---------------Morganlake	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight---------	Slight---------	Slight.
120C---------------Morganlake	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Spring, fall, winter.	Slight---------	Moderate: slope.	Slight.
123D---------------Klacking	Slight----------	Moderate: slope.	Slight---------	Year round-----	Slight---------	Moderate: slope.	Slight.
124----------------Evart	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight---------	Slight---------	Slight.
127----------------Cathro	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter----------	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
128----------------Dawson	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter----------	Moderate: low strength.	Severe: low strength.	Moderate: low strength.

Table 8.--Equipment Limitations on Woodland--Continued

Soil name and map symbol	Ratings for most limiting season(s)			Preferred operating season(s)	Ratings for preferred operating season(s)		
	Logging areas and skid roads	Log landings	Haul roads		Logging areas and skid roads	Log landings	Haul roads
130-------------- Grousehaven	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter, summer	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
159A------------- Finch	Severe: wetness.	Severe: wetness.	Severe: wetness.	Winter, summer	Slight--------	Slight--------	Slight.
197A------------- Gladwin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight--------	Slight--------	Slight.
209B------------- Grayling	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight--------	Slight--------	Slight.
209C------------- Grayling	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Spring, fall, winter.	Slight--------	Moderate: slope.	Slight.
209D------------- Grayling	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy, slope.	Spring, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
210B------------- Grayling	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight--------	Slight--------	Slight.
210C------------- Grayling	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Spring, fall, winter.	Slight--------	Moderate: slope.	Slight.
210D------------- Grayling	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy, slope.	Spring, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
210E------------- Grayling	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy, slope.	Spring, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
211B------------- Grayling	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight--------	Slight--------	Slight.
212B------------- Grayling	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight--------	Slight--------	Slight.
213B------------- Graycalm	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight--------	Slight--------	Slight.

Table 8.--Equipment Limitations on Woodland--Continued

Soil name and map symbol	Ratings for most limiting season(s)			Preferred operating season(s)	Ratings for preferred operating season(s)		
	Logging areas and skid roads	Log landings	Haul roads		Logging areas and skid roads	Log landings	Haul roads
214B: Typic Udipsamments	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight	Slight	Slight.
215B: Typic Udipsamments	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight	Slight	Slight.
216B: Typic Udipsamments	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight	Slight	Slight.
220B: Typic Udipsamments	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight	Slight	Slight.
220D: Typic Udipsamments	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy, slope.	Spring, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
220E: Typic Udipsamments	Severe: slope.	Severe: slope.	Severe: slope.	Spring, fall, winter.	Severe: slope.	Severe: slope.	Severe: slope.
221B: Typic Udipsamments	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight	Slight	Slight.
221C: Typic Udipsamments	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Spring, fall, winter.	Slight	Moderate: slope.	Slight.
221D: Typic Udipsamments	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy, slope.	Spring, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
221E: Typic Udipsamments	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy, slope.	Spring, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
222B: Typic Udipsamments	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight	Slight	Slight.

Table 8.--Equipment Limitations on Woodland--Continued

Soil name and map symbol	Ratings for most limiting season(s)				Ratings for preferred operating season(s)		
	Logging areas and skid roads	Log landings	Haul roads	Preferred operating season(s)	Logging areas and skid roads	Log landings	Haul roads
223B:							
Graycalm	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight	Slight	Slight.
Grayling	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight	Slight	Slight.
223C:							
Graycalm	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Spring, fall, winter.	Slight	Moderate: slope.	Slight.
Grayling	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Spring, fall, winter.	Slight	Moderate: slope.	Slight.
223D:							
Graycalm	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy, slope.	Spring, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
Grayling	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy, slope.	Spring, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
223E:							
Graycalm	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy, slope.	Spring, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
Grayling	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy, slope.	Spring, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
224B Croswell	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight	Slight	Slight.
225B Entic Haplorthods	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight	Slight	Slight.
225C Entic Haplorthods	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Spring, fall, winter.	Slight	Moderate: slope.	Slight.

Table 8.--Equipment Limitations on Woodland--Continued

Soil name and map symbol	Ratings for most limiting season(s): Logging areas and skid roads	Ratings for most limiting season(s): Log landings	Ratings for most limiting season(s): Haul roads	Preferred operating season(s)	Ratings for preferred operating season(s): Logging areas and skid roads	Ratings for preferred operating season(s): Log landings	Ratings for preferred operating season(s): Haul roads
231D:							
Entic Haplorthods-----	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy, slope.	Spring, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
Alfic Haplorthods-----	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy, slope.	Spring, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
231E:							
Entic Haplorthods-----	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy, slope.	Spring, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
Alfic Haplorthods-----	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy, slope.	Spring, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
232B:							
Entic Haplorthods-----	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight--------	Slight--------	Slight.
Alfic Haplorthods-----	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight--------	Slight--------	Slight.
233B:							
Alfic Haplorthods-----	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight--------	Slight--------	Slight.
Entic Haplorthods-----	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight--------	Slight--------	Slight.
233C:							
Alfic Haplorthods-----	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Spring, fall, winter.	Slight--------	Moderate: slope.	Slight.

Table 8.--Equipment Limitations on Woodland--Continued

Soil name and map symbol	Ratings for most limiting season(s): Logging areas and skid roads	Log landings	Haul roads	Preferred operating season(s)	Ratings for preferred operating season(s): Logging areas and skid roads	Log landings	Haul roads
233C:							
Entic Haplorthods-----	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Spring, fall, winter.	Slight--------	Moderate: slope.	Slight.
233D:							
Alfic Haplorthods-----	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy, slope.	Spring, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
Entic Haplorthods-----	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy, slope.	Spring, fall, winter.	Moderate: slope	Severe: slope.	Moderate: slope.
235B:							
Alfic Haplorthods, sandy over loamy-----------	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight--------	Slight--------	Slight.
Alfic Haplorthods, sandy-----------	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight--------	Slight--------	Slight.
235C:							
Alfic Haplorthods, sandy over loamy-----------	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Spring, fall, winter.	Slight--------	Moderate: slope.	Slight.
Alfic Haplorthods, sandy-----------	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Spring, fall, winter.	Slight--------	Moderate: slope.	Slight.

Table 8.--Equipment Limitations on Woodland--Continued

Soil name and map symbol	Ratings for most limiting season(s)			Preferred operating season(s)	Ratings for preferred operating season(s)		
	Logging areas and skid roads	Log landings	Haul roads		Logging areas and skid roads	Log landings	Haul roads
236B: Arenic Eutroboralfs	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Spring, fall, winter.	Slight	Slight	Slight.
254A:							
Borosaprists.							
Fluvaquents.							
Aquic Udipsamments	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight	Slight	Slight.
262A: Au Gres	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight	Slight	Slight.
264A: Allendale	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight	Slight	Slight.
265B:							
Eutroboralfs.							
Allendale	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight	Slight	Slight.
266A: Typic Duraquods	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight	Slight	Slight.
273:							
Leafriver	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight	Slight	Slight.
Wakeley	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight	Slight	Slight.
343: Sims	Severe: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, winter	Slight	Slight	Slight.
355E:							
Crowell	Moderate: too sandy, slope.	Moderate: too sandy, slope.	Moderate: too sandy, slope.	Spring, fall, winter.	Moderate: slope.	Moderate: slope.	Moderate: slope.

Table 8.--Equipment Limitations on Woodland--Continued

Soil name and map symbol	Ratings for most limiting season(s): Logging areas and skid roads	Log landings	Haul roads	Preferred operating season(s)	Ratings for preferred operating season(s): Logging areas and skid roads	Log landings	Haul roads
355E:							
Proper-----------	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, summer, winter.	Slight--------	Slight--------	Slight.
360--------------- Wakeley	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight--------	Slight--------	Slight.
367A:							
Whittemore-------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Winter, summer	Slight--------	Slight--------	Slight.
Springport-------	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight--------	Slight--------	Slight.
368A:							
Au Gres----------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight--------	Slight--------	Slight.
Deford-----------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Winter, summer	Slight--------	Slight--------	Slight.
369--------------- Deford	Severe: wetness.	Severe: wetness.	Severe: wetness.	Winter, summer	Slight--------	Slight--------	Slight.
370A-------------- McIvor	Severe: wetness.	Severe: wetness.	Severe: wetness.	Winter, summer	Slight--------	Slight--------	Slight.
371--------------- Springport	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight--------	Slight--------	Slight.
372B:							
Proper-----------	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, summer, winter.	Slight--------	Slight--------	Slight.
Leafriver--------	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight--------	Slight--------	Slight.
375--------------- Kanotin	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter, summer	Moderate: low strength.	Severe: low strength.	Moderate: low strength.

Table 8.--Equipment Limitations on Woodland--Continued

Soil name and map symbol	Ratings for most limiting season(s): Logging areas and skid roads	Log landings	Haul roads	Preferred operating season(s)	Ratings for preferred operating season(s): Logging areas and skid roads	Log landings	Haul roads
377-----Wabun	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter, summer	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
378A-----Algonquin	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter, summer	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
379A:							
Algonquin-----	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter, summer	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
Springport-----	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter	Slight-----	Slight-----	Slight.
381A:							
McIvor-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Winter, summer	Slight-----	Slight-----	Slight.
Wakeley-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight-----	Slight-----	Slight.
382B-----Proper	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, summer, winter.	Slight-----	Slight-----	Slight.
383B-----Wurtsmith	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, summer, winter.	Slight-----	Slight-----	Slight.
392-----Caffey	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter, summer	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.
403B-----Iargo	Severe: wetness, low strength.	Severe: wetness.	Severe: wetness.	Winter, summer	Slight-----	Slight-----	Slight.
403C-----Iargo	Severe: wetness, low strength.	Severe: wetness.	Severe: wetness.	Winter, summer	Slight-----	Moderate: slope.	Slight.
404A-----Manary	Severe: wetness, low strength.	Severe: wetness.	Severe: wetness.	Winter, summer	Slight-----	Moderate: too clayey.	Moderate: too clayey.

Table 8.--Equipment Limitations on Woodland--Continued

Soil name and map symbol	Ratings for most limiting season(s)			Preferred operating season(s)	Ratings for preferred operating season(s)		
	Logging areas and skid roads	Log landings	Haul roads		Logging areas and skid roads	Log landings	Haul roads
405B:							
Manary-----------	Severe: wetness, low strength.	Severe: wetness.	Severe: wetness.	Winter, summer	Slight--------	Moderate: too clayey.	Moderate: too clayey.
Iargo------------	Severe: wetness, low strength.	Severe: wetness.	Severe: wetness.	Winter, summer	Slight--------	Slight--------	Slight.
406A-------------- Winterfield	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight--------	Slight--------	Slight.
407--------------- Lacota	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight--------	Slight--------	Slight.
408--------------- Sims	Severe: wetness, low strength.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight--------	Slight--------	Slight.
409A:							
Finch------------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Winter, summer	Slight--------	Slight--------	Slight.
Deford-----------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Winter, summer	Slight--------	Slight--------	Slight.
Au Gres----------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight--------	Slight--------	Slight.
410B:							
Proper-----------	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, summer, winter.	Slight--------	Slight--------	Slight.
Finch------------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Winter, summer	Slight--------	Slight--------	Slight.
Deford-----------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Winter, summer	Slight--------	Slight--------	Slight.
411A-------------- Meehan	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight--------	Slight--------	Slight.
425D-------------- Hottis	Moderate: low strength.	Moderate: slope.	Slight--------	Summer, winter	Moderate: too clayey.	Moderate: slope.	Slight.

Table 8.--Equipment Limitations on Woodland--Continued

Soil name and map symbol	Ratings for most limiting season(s)			Preferred operating season(s)	Ratings for preferred operating season(s)		
	Logging areas and skid roads	Log landings	Haul roads		Logging areas and skid roads	Log landings	Haul roads
426B-------------- Coppler	Slight---------	Slight--------	Slight--------	Year round-----	Slight--------	Slight--------	Slight.
426C-------------- Coppler	Slight---------	Moderate: slope.	Slight--------	Year round-----	Slight--------	Moderate: slope.	Slight.
427--------------- Tonkey	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight--------	Slight--------	Slight.
429D-------------- Menominee	Moderate: slope.	Severe: slope.	Moderate: slope.	Spring, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
430D-------------- Mongo	Moderate: low strength, slope.	Severe: slope.	Moderate: low strength, slope.	Summer, winter	Moderate: slope.	Severe: slope.	Moderate: slope.
430E-------------- Mongo	Moderate: low strength, slope.	Severe: slope.	Moderate: low strength, slope.	Summer, winter	Moderate: slope.	Severe: slope.	Moderate: slope.
431B-------------- Skeel	Slight---------	Slight--------	Slight--------	Spring, fall, winter.	Slight--------	Slight--------	Slight.
432B:							
Wurtsmith--------	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, summer, winter.	Slight--------	Slight--------	Slight.
Meehan-----------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight--------	Slight--------	Slight.
433B:							
Morganlake-------	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight--------	Slight--------	Slight.
Graycalm---------	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, fall, winter.	Slight--------	Slight--------	Slight.
434D:							
Graycalm---------	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy.	Spring, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.
Menominee--------	Moderate: slope.	Severe: slope.	Moderate: slope.	Spring, fall, winter.	Moderate: slope.	Severe: slope.	Moderate: slope.

Table 8.--Equipment Limitations on Woodland--Continued

Soil name and map symbol	Ratings for most limiting season(s): Logging areas and skid roads	Log landings	Haul roads	Preferred operating season(s)	Ratings for preferred operating season(s): Logging areas and skid roads	Log landings	Haul roads
434D:							
Morganlake--------	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Spring, fall, winter.	Slight--------	Moderate: slope.	Slight.
443B:							
Kawkawlin---------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Winter, summer	Slight--------	Slight--------	Slight.
Allendale---------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight--------	Slight--------	Slight.
Aquepts.							
444B-------------- Kawkawlin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Winter, summer	Slight--------	Slight--------	Slight.
445A-------------- Corsair	Severe: wetness.	Severe: wetness.	Severe: wetness.	Winter, summer	Slight--------	Slight--------	Slight.
446B:							
Wurtsmith---------	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Spring, summer, winter.	Slight--------	Slight--------	Slight.
Meehan------------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight--------	Slight--------	Slight.
Urban land.							
447A-------------- Whittemore	Severe: wetness.	Severe: wetness.	Severe: wetness.	Winter, summer	Slight--------	Slight--------	Slight.
448A:							
Meehan------------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter	Slight--------	Slight--------	Slight.
Tawas-------------	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter---------	Moderate: low strength.	Severe: low strength.	Moderate: low strength.
449A-------------- Kokosing	Severe: wetness.	Severe: wetness.	Severe: wetness.	Winter, summer	Slight--------	Slight--------	Slight.

Table 9.--Plant Communities on Selected Soils

(Absence of an entry indicates that information was not available)

Soil name and map symbol	Extent of major and minor trees*	Extent of seedlings*	Extent of shrubs*	Extent of ferns and clubmoss*	Extent of ground plants*
12B:					
Tawas	Silver maple 5 Red maple 4 Northern whitecedar 4 Bigtooth aspen 3 Paper birch 3 Eastern white pine 3 American basswood 2 Quaking aspen 2 Black spruce 1 American elm 1	Red maple 3 Black ash 2	Redosier dogwood 3 Speckled alder 3	Maidenhair fern 4 Oakfern 4 Shield fern 3 Cinnamon fern 3 Ladyfern 3	Grasses 5 Sedges 4 Horsetails 3 Jack in the pulpit 3 Starflower 3 Violets 3 Blueflag 3 Brambles 2 Dewberry 2 Sphagnum moss 2 Trilliums 2 Sessileaf bellwort 2
Au Gres	Paper birch 3 Northern red oak 3 Bigtooth aspen 3 Green ash 3 Balsam fir 2 Chokecherry 2 Quaking aspen 1	Bigtooth aspen 4 White oak 2 Chokecherry 2 Paper birch 2 Northern whitecedar 1	Speckled alder 3	Brackenfern 4 Ground cedar 3	Canada mayflower 4 Barren strawberry 4 Sedges 3 Starflower 3 Bunchberry 3 Gay wings 3 Canada blueberry 2
13 Tawas-Lupton	Northern whitecedar 5 Balsam fir 3 Hemlock 3 Black ash 2 Paper birch 2 Balsam poplar 2 Red maple 2	Balsam poplar 3 Black ash 3 Red maple 3 Balsam fir 2	Willows 4 Speckled alder 3 Redosier dogwood 2 Silky dogwood 2	Sensitive fern 4 Ladyfern 3 Oakfern 3 Shield fern 3 Royalfern 3	Sphagnum moss 5 Sedges 4 Horsetails 4 Bedstraws 3 Bunchberry 3 Goldthread 3 Jack in the pulpit 3 Starflower 3 Violets 3 Wild strawberry 3 Blue beadlily 3 Blueberries 2 Twinflower 2
16B, 16D Graycalm	Northern red oak 4 Jack pine 3 Black oak 3 Eastern white pine 3 Bigtooth aspen 2 Quaking aspen 2 Red pine 2 White oak 1	Eastern white pine 3 Quaking aspen 3 Black oak 2 Jack pine 2 Northern red oak 2 Red pine 2 Red maple 1	Serviceberry 2 Sand cherry 3 Witchhazel 2	Brackenfern 3	Grasses 4 Low bush blueberry 4 Bearberry 3 Sedges 3 Sweetfern 2 Princes pine 2 Cow wheat 2 Trailing 2 arbutus 2 Blue cladonia 2

See footnote at end of table.

Table 9.--Plant Communities on Selected Soils--Continued

Soil name and map symbol	Extent of major and minor trees*	Extent of seedlings*	Extent of shrubs*	Extent of ferns and clubmoss*	Extent of ground plants*
17B-------------- Croswell	Quaking aspen-- 4 Bigtooth aspen- 4 Red maple------ 4 Northern red oak----------- 4 Paper birch---- 3 American beech- 3 Yellow birch--- 2 Jack pine------ 2 Black oak------ 2 Eastern white pine---------- 2 Balsam fir----- 2	Quaking aspen-- 4 Bigtooth aspen- 3 Northern red oak----------- 3 Paper birch---- 3 Red maple------ 3 Yellow birch--- 2 White spruce--- 2 Eastern white pine---------- 2	Serviceberry--- 2	Brackenfern----- 5	Grasses--------- 5 Blueberries----- 5 Wintergreen----- 4 Sweetfern------- 4 Barren strawberry----- 3 Wild strawberry- 3 Sheep laurel---- 3 Brambles-------- 3 Pink lady slipper-------- 3 Starflower------ 3 Canada mayflower------ 2 Blue beadlily--- 2 Poison ivy------ 2 Low bush blueberry------ 2 Large-leaved aster---------- 1
18A-------------- Au Gres	Red maple------ 4 Paper birch---- 4 Northern red oak----------- 3 Bigtooth aspen- 3 Green ash------ 3 Balsam fir----- 2 Chokecherry---- 2 Quaking aspen-- 2	Balsam fir----- 4 Bigtooth aspen- 4 Red maple------ 3 White oak------ 2 Chokecherry---- 2 Paper birch---- 2 Northern red oak----------- 2 Eastern white pine---------- 2 Northern whitecedar---- 1	Serviceberry--- 3 Speckled alder- 3	Brackenfern----- 4 Ground cedar---- 3	Wintergreen----- 4 Canada mayflower------ 4 Barren strawberry----- 4 Low bush blueberry------ 3 Sedges---------- 3 Starflower------ 3 Bunchberry------ 3 Gay wings------- 3 Indian cucumber root----------- 2 Canada blueberry------ 2
19--------------- Leafriver	Black spruce--- 3 Balsam fir----- 2 Red maple------ 2	Red maple------ 3 Balsam fir----- 3	Speckled alder- 2	Sensitive fern-- 4 Royal fern------ 3 Shield fern----- 2	Canada mayflower------ 3 Goldthread------ 3 Twinflower------ 2
25B, 25C--------- Kent	Red maple------ 3 Northern red oak----------- 3 White oak------ 3	Red maple------ 3 Northern red oak----------- 3 White oak------ 3 Chokecherry---- 3	Serviceberry--- 3 Witchhazel----- 3 Silky dogwood-- 3	Brackenfern----- 2	Large-leaved aster---------- 2 Low bush blueberry------ 2 Wintergreen----- 2
26B-------------- Cublake	White oak------ 3 Northern red oak----------- 3 Bigtooth aspen- 2 Red maple------ 2 Balsam fir----- 2	Eastern white pine---------- 5 Jack pine------ 2 Bigtooth aspen- 2 Chokecherry---- 2 Balsam fir----- 1	Witchhazel----- 3 Serviceberry--- 2	Brackenfern----- 5	Blueberries----- 3 Brambles-------- 3 Goldenrods------ 3 Starflower------ 3 Wintergreen----- 3 Gay wings------- 2

See footnote at end of table.

Table 9.--Plant Communities on Selected Soils--Continued

Soil name and map symbol	Extent of major and minor trees*	Extent of seedlings*	Extent of shrubs*	Extent of ferns and clubmoss*	Extent of ground plants*
47D, 47F---------Graycalm	Northern red oak----------- 4	Eastern white pine---------- 3	Serviceberry--- 3	Brackenfern----- 3	Grasses--------- 4
	Jack pine------ 3	Quaking aspen-- 3	Witchhazel----- 2		Low bush blueberry------ 4
	Black oak------ 3	Black oak------ 2			Bearberry------- 3
	Eastern white pine---------- 3	Jack pine------ 2			Hairgrass------- 3
	Bigtooth aspen- 2	Northern red oak----------- 2			Sand cherry----- 3
	Quaking aspen-- 2	Red pine------- 2			Sedges---------- 3
	Red pine------- 2	Red maple------ 1			Sweetfern------- 2
	White oak------ 1				Trailing arbutus-------- 2
					Blue cladonia--- 2
55---------------Springport	Black ash------ 5	Balsam fir----- 3	Speckled alder- 5	Sensitive fern-- 5	Grasses--------- 4
	Paper birch---- 3		Dogwoods------- 4	Royal fern------ 3	Cattails-------- 3
	Balsam fir----- 3			Shield fern----- 3	Marsh marigold-- 3
57B--------------Kawkawlin	Bigtooth aspen- 4	Red maple------ 5	Witchhazel----- 5	Brackenfern----- 4	Grasses--------- 4
	White oak------ 3	Bigtooth aspen- 4	Hawthorns------ 2	Sensitive fern-- 2	Barren strawberry----- 3
	Red maple------ 3	White oak------ 3			Blueberries----- 3
	Quaking aspen-- 3	Black ash------ 2			Bunchberry------ 3
	Paper birch---- 2	Eastern white pine---------- 2			Sedges---------- 3
					Violets--------- 3
					Canada mayflower------ 3
					Large-leaved aster---------- 3
					Starflower------ 3
					Sweet cicely---- 3
					Wild sarsaparilla--- 3
					Brambles-------- 2
					Round-leaved pyrolas-------- 2
					Trilliums------- 2
58A:					
Wakeley---------	Black ash------ 4	Eastern white pine---------- 2	Redosier dogwood------- 3	Sensitive fern-- 2	Sedges---------- 3
	Eastern cottonwood---- 3		Speckled alder- 3	Shield fern----- 2	
	Red maple------ 2				
	Quaking aspen-- 2				
	Eastern white pine---------- 2				

See footnote at end of table.

Table 9.--Plant Communities on Selected Soils--Continued

Soil name and map symbol	Extent of major and minor trees*	Extent of seedlings*	Extent of shrubs*	Extent of ferns and clubmoss*	Extent of ground plants*
58A:					
Allendale	Red maple------ 4	Red maple------ 3	Honeysuckle vine---------- 2	Brackenfern----- 5	Bunchberry------ 4
	Quaking aspen-- 3	Balsam fir----- 2	Serviceberry--- 1		Canada mayflower------ 4
	Bigtooth aspen- 3	Quaking aspen-- 2			Starflower------ 3
	Paper birch---- 2	Northern red oak----------- 1			Sedges---------- 3
	Eastern white pine---------- 2				Low bush blueberry------ 3
	Balsam fir----- 2				Brambles-------- 3
					Gay wings------- 3
					Large-leaved aster---------- 3
					Wild sarsaparilla--- 3
					Wintergreen----- 3
					Sweet coltsfoot- 3
					Currants-------- 3
					Asters---------- 3
					Blue beadlily--- 2
					Cinquefoils----- 2
					Blueberries----- 2
					Bedstraws------- 2
					Boneset--------- 2
					Grasses--------- 2
					Canada white violet--------- 2
					Downy yellow violet--------- 2
62A Allendale	Red maple------ 4	Red maple------ 3	Honeysuckle vine---------- 2	Brackenfern----- 5	Bunchberry------ 4
	Quaking aspen-- 3	Balsam fir----- 2	Serviceberry--- 1		Canada mayflower------ 4
	Bigtooth aspen- 3	Quaking aspen-- 2			Starflower------ 3
	Paper birch---- 2	Northern red oak----------- 1			Sedges---------- 3
	Eastern white pine---------- 2				Low bush blueberry------ 3
	Balsam fir----- 2				Brambles-------- 3
					Gay wings------- 3
					Large-leaved aster---------- 3
					Wild sarsaparilla--- 3
					Wintergreen----- 3
					Sweet coltsfoot- 3
					Currants-------- 3
					Asters---------- 3
					Blue beadlily--- 2
					Cinquefoils----- 2
					Blueberries----- 2
					Bedstraws------- 2
					Boneset--------- 2
					Grasses--------- 2
					Canada white violet--------- 2
					Downy yellow violet--------- 2

See footnote at end of table.

Table 9.--Plant Communities on Selected Soils--Continued

Soil name and map symbol	Extent of major and minor trees*	Extent of seedlings*	Extent of shrubs*	Extent of ferns and clubmoss*	Extent of ground plants*
70---------------Lupton	Northern whitecedar---- 4 Balsam fir----- 4 Black spruce--- 3 Eastern white pine---------- 3 Paper birch---- 3 Balsam poplar-- 2 Tamarack------- 2 American elm--- 2	Balsam fir----- 3 Black spruce--- 3 Tamarack------- 3 Northern whitecedar---- 2	Speckled alder- 5 Willows-------- 3 Silky dogwood-- 3	Sensitive fern-- 4 Cinnamon fern--- 2 Interrupted fern----------- 2 Ladyfern-------- 2 Ostrich fern---- 2 Staghorn club moss----------- 3	Sphagnum moss--- 6 Sedges---------- 5 Partridgeberry-- 3 Stinging nettles-------- 3 Labrador tea---- 3 Grasses--------- 3 Orchids--------- 2 Pale laurel----- 2 Twinflower------ 2
71---------------Tawas	Silver maple--- 5 Red maple------ 4 Northern whitecedar---- 4 Bigtooth aspen- 3 Paper birch---- 3 Eastern white pine---------- 3 American basswood------ 2 Quaking aspen-- 2 Black spruce--- 1 American elm--- 1	Red maple------ 3 Black ash------ 2	Redosier dogwood------- 3	Oakfern--------- 4 Cinnamon fern--- 4 Shield fern----- 3 Ladyfern-------- 3	Grasses--------- 5 Sedges---------- 4 Horsetails------ 3 Jack in the pulpit--------- 3 Miterworts------ 3 Starflower------ 3 Violets--------- 3 Blueflag-------- 3 Brambles-------- 2 Dewberry-------- 2 Sphagnum moss--- 2 Trilliums------- 2 Sessileaf bellwort------- 2
72---------------Dorval	Silver maple--- 4 Black ash------ 3	---	Willows-------- 3	---	Sedges---------- 4 Nettles--------- 3 Jewelweed------- 3 Jack in the pulpit--------- 3
75B, 75D, 75E, 75F-------------Rubicon	Red maple------ 4 Black oak------ 3 Quaking aspen-- 3 Bigtooth aspen- 3 White oak------ 2 Eastern white pine---------- 2 Northern red oak----------- 2 Balsam fir----- 1	Eastern white pine---------- 4 Red maple------ 3 Black oak------ 3 Northern red oak----------- 3 Balsam fir----- 1	Serviceberry--- 3 Witchhazel----- 3	Brackenfern----- 5	Grasses--------- 4 Canada blueberry------ 3 Low bush blueberry------ 3 Sweetfern------- 3 Hairgrass------- 3 Canada mayflower------ 2 Reindeer lichen- 2
81B, 81D, 81E----Grayling	Black oak------ 4 Northern red oak----------- 4 Bigtooth aspen- 4 Jack pine------ 4 Eastern white pine---------- 4 White oak------ 3 Northern pin oak----------- 3 Red pine------- 2	Northern red oak----------- 5 Black oak------ 4 Bigtooth aspen- 4 Eastern white pine---------- 3 Red maple------ 2	Sand cherry---- 2	Brackenfern----- 4	Grasses--------- 5 Low bush blueberry------ 4 Bearberry------- 3 Sweetfern------- 3 Wintergreen----- 3 Reindeer lichen- 3 Brambles-------- 2

See footnote at end of table.

Table 9.--Plant Communities on Selected Soils--Continued

Soil name and map symbol	Extent of major and minor trees*	Extent of seedlings*	Extent of shrubs*	Extent of ferns and clubmoss*	Extent of ground plants*
97: Colonville	Black ash------ 3 Silver maple--- 3 Slippery elm--- 2 American basswood------ 2	Slippery elm--- 2	Silky dogwood-- 2	Ostrich fern---- 4 Shield fern----- 1	Meadowrues------ 4 Miterworts------ 4 Violets--------- 4 Goldenrods------ 3 Jack in the pulpit--------- 3 Currants-------- 2 Baneberries----- 2
100D, 100E: Curtisville	Sugar maple---- 4 American beech- 4 Eastern white pine---------- 4 Red maple------ 4 American basswood------ 4 Bigtooth aspen- 3 White oak------ 2 Northern red oak----------- 2 Hophornbeam---- 2 White ash------ 2	Red maple------ 4 American beech- 4 Eastern white pine---------- 4 Bigtooth aspen- 4 American basswood------ 3 White ash------ 3 White oak------ 2	Serviceberry--- 4 Flowering dogwood------- 4 Hawthorns------ 3 Witchhazel----- 3	Brackenfern----- 4	Large-leaved aster---------- 5 Hairy solomon's seal----------- 3 Canada mayflower------ 3 Violets--------- 3 Wintergreen----- 3 Trilliums------- 3 Wild strawberry----- 3 Starflower------ 2 Yellow ladyslipper---- 2
120B, 120C: Morganlake	Red maple------ 4 Quaking aspen-- 4 Bigtooth aspen- 3 Paper birch---- 3 White ash------ 3 Red pine------- 3 Northern red oak----------- 3 White oak------ 3 Pin cherry----- 2 Jack pine------ 2 American beech- 2	Quaking aspen-- 5 Red maple------ 3 White ash------ 3 White oak------ 2 Northern red oak----------- 2 Balsam fir----- 1 Bigtooth aspen- 2	Serviceberry--- 4 Witchhazel----- 4 Mapleleaf viburnum------ 4 Silky dogwood-- 2 Hawthorns------ 2	Brackenfern----- 4	Large-leaved aster---------- 4 Wintergreen----- 4 Rosy twistedstalk--- 3 Violets--------- 3 Wild strawberry----- 3 Wood betony----- 3 Bedstraws------- 3 Bunchberry------ 3 Low bush blueberry------ 3 Starflower------ 3 Sedges---------- 3 Grasses--------- 3 Tick clovers---- 3 Gay wings------- 3 Wild sarsaparilla--- 3 Trilliums------- 2 Sweet coltsfoot- 2 Asters---------- 2 Canada mayflower------ 2 Yellow ladyslipper---- 2 Round-leaved pyrolas-------- 2 Baneberries----- 2 Barren strawberry----- 2

See footnote at end of table.

Table 9.--Plant Communities on Selected Soils--Continued

Soil name and map symbol	Extent of major and minor trees*	Extent of seedlings*	Extent of shrubs*	Extent of ferns and clubmoss*	Extent of ground plants*
128 Dawson	Tamarack 4 Balsam fir 4 Jack pine 3 Eastern white pine 2 Red pine 2 Black spruce 2	Tamarack 2	Leatherleaf 6	---	Sphagnum moss 6 Labrador tea 3 Pale laurel 3
130 Grousehaven	Northern whitecedar 4 Black ash 3	---	Speckled alder 3 Willows 3	---	---
159A Finch	Red maple 3 Jack pine 3 Paper birch 2	---	---	Brackenfern 3	Sheep laurel 6 Low bush blueberry 4 Bunchberry 3 Canada mayflower 3 Wintergreen 3 Starflower 2
355E Crowell-Proper	Bigtooth aspen 4 Eastern white pine 4 Red maple 3 Northern red oak 3 Red pine 2	Eastern white pine 2 White spruce 2	Witchhazel 4	Brackenfern 4	Low bush blueberry 4 Canada mayflower 3 Wintergreen 3 Starflower 2
360 Wakeley	Black ash 4 Eastern cottonwood 3 Red maple 3 Quaking aspen 2 Eastern white pine 2	Eastern white pine 2	Redosier dogwood 3 Speckled alder 3	Sensitive fern 2 Shield fern 2	Sedges 3
368A Au Gres-Deford	Red maple 3 Paper birch 3 Northern red oak 3 Balsam fir 2 Green ash 2 Bigtooth aspen 2 Quaking aspen 1	Balsam fir 4 Paper birch 2 White oak 2 Northern whitecedar 1	Serviceberry 3	---	Bunchberry 3 Gay wings 3 Starflower 3 Canada mayflower 3 Wintergreen 3 Canada blueberry 2

See footnote at end of table.

Table 9.--Plant Communities on Selected Soils--Continued

Soil name and map symbol	Extent of major and minor trees*	Extent of seedlings*	Extent of shrubs*	Extent of ferns and clubmoss*	Extent of ground plants*
370A------------- McIvor	Red maple------ 4 Bigtooth aspen- 3 Quaking aspen-- 3 Paper birch---- 3 Red pine------- 3 Northern red oak----------- 3 Balsam fir----- 2	Red maple------ 5 Northern red oak----------- 4 Eastern white pine---------- 4 Black oak------ 2	Serviceberry--- 3 Witchhazel----- 3	Brackenfern----- 3 Interrupted fern----------- 3	Low bush blueberry------ 5 Bunchberry------ 5 Wintergreen----- 5 Blueberries----- 4 Indian cucumber root----------- 4 Barren strawberry----- 3 Starflower------ 3 Sheep laurel---- 3 Sedges---------- 2 Dewberry-------- 2 Virginia creeper-------- 1
371-------------- Springport	Balsam poplar-- 3 Eastern cottonwood---- 3	---	Speckled alder- 3	---	---
377-------------- Wabun	Black ash------ 3 Red maple------ 2	---	Speckled alder- 1	---	---
378A------------- Algonquin	Quaking aspen-- 4 Balsam poplar-- 4 Red maple------ 3 Northern whitecedar---- 2 Eastern white pine---------- 1	Green ash------ 2	---	Brackenfern----- 3	Brambles-------- 5 Large-leaved aster---------- 4 Goldenrods------ 3 Round-leaved pyrolas-------- 2
381A------------- McIvor-Wakeley	Red maple------ 4 Quaking aspen-- 4 Paper birch---- 3	Red maple------ 4 Quaking aspen-- 3 Paper birch---- 3	Serviceberry--- 3 Witchhazel----- 3	Royal fern------ 5 Brackenfern----- 5 Shield fern----- 2 Ground pine----- 2	Wintergreen----- 5 Marsh marigold-- 3 Sedges---------- 3 Canada blueberry------ 3 Bunchberry------ 3
383B------------- Wurtsmith	Black oak------ 4 Bigtooth aspen- 3 Red maple------ 3 Jack pine------ 3	Black oak------ 3 Pin cherry----- 2	Serviceberry--- 2	Brackenfern----- 4	Canada blueberry------ 4 Wintergreen----- 4 Brambles-------- 3 Large-leaved aster---------- 3 Wild strawberry----- 3 Cow wheat------- 2 Starflower------ 2 Canada mayflower------ 2
392-------------- Caffey	Green ash------ 4 Quaking aspen-- 4 Red maple------ 3	---	Speckled alder- 5 Alternateleaf dogwood------- 4 Willows-------- 3 Honeysuckle vine---------- 3	Sensitive fern-- 3 Brackenfern----- 2	Large-leaved aster---------- 4 Grasses--------- 4

See footnote at end of table.

Table 9.--Plant Communities on Selected Soils--Continued

Soil name and map symbol	Extent of major and minor trees*	Extent of seedlings*	Extent of shrubs*	Extent of ferns and clubmoss*	Extent of ground plants*
406A------------- Winterfield	Swamp white oak----------- 4	American basswood------ 4	Hawthorns------ 2	Sensitive fern-- 2	Bloodroot------- 3
	Silver maple--- 2	American elm--- 4		Shield fern----- 2	Currants-------- 3
	White ash------ 1	Blue beech----- 2			Violets--------- 3
	Sugar maple---- 1				Jewelweed------- 3
					Meadowrues------ 3
					Sweet cicely---- 3
					Poison ivy------ 2
					Brambles-------- 2
					False solomon's seal----------- 2
					Grasses--------- 2
					Virginia creeper-------- 2
407-------------- Lacota	Swamp white oak----------- 4	Chokecherry---- 2	Alternateleaf dogwood------- 3	Shield fern----- 3	Goldenrods------ 6
	Black ash------ 3	American elm--- 1	Redosier dogwood------- 3	Ladyfern-------- 3	Trilliums------- 3
	Silver maple--- 2		Red elderberry- 3	Sensitive fern-- 1	Trout lily------ 3
	Eastern cottonwood---- 1		Willows-------- 3		Meadowrues------ 2
			Wild pink spirea-------- 3		Mints----------- 2
			Swamp rose----- 3		Baneberry------- 2
					Sweet cicely---- 2
					Canada mayflower------ 2
408-------------- Sims	Quaking aspen-- 3	Swamp white oak----------- 2	Redosier dogwood------- 3	Ladyfern-------- 3	Grasses--------- 4
	Green ash------ 3		Speckled alder- 3	Brackenfern----- 2	Goldenrods------ 3
	Swamp white oak----------- 2		Wild pink spirea-------- 3	Sensitive fern-- 2	Barren strawberry----- 3
	Paper birch---- 2		Alternateleaf dogwood------- 3		Horsetails------ 3
	American basswood------ 2		Honeysuckle vines--------- 3		Large-leaved aster---------- 3
					Solomon's seal-- 3
					Violets--------- 3
					Yarrow---------- 2
					Sedges---------- 2
					Bedstraws------- 2
					Canada mayflower------ 2
					Turtleheads----- 2
					Virginia creeper-------- 2
411A------------- Meehan	Red pine------- 4	Northern red oak----------- 2	Serviceberry--- 3	Brackenfern----- 4	Wintergreen----- 4
	Paper birch---- 3	Eastern white pine---------- 2	Speckled alder- 1		Barren strawberry----- 3
	Red maple------ 3	White spruce--- 2			Bunchberry------ 3
	Eastern white pine---------- 2				Starflower------ 3
	Black oak------ 2				Canada mayflower------ 3
					Low bush blueberry------ 2
					Canada blueberry------ 2

See footnote at end of table.

Table 9.--Plant Communities on Selected Soils--Continued

Soil name and map symbol	Extent of major and minor trees*	Extent of seedlings*	Extent of shrubs*	Extent of ferns and clubmoss*	Extent of ground plants*
426B, 426C------- Coppler	Balsam fir----- 4 Northern red oak----------- 3 Red maple------ 3 White oak------ 1	Red maple------ 4 Balsam fir----- 2	---	Brackenfern----- 4 Oakfern--------- 1	Wintergreen----- 3 Smooth yellow violet--------- 3 Gay wings------- 2 Canada mayflower------ 2 Wood betony----- 2
429D------------- Menominee	Northern red oak----------- 4 Bigtooth aspen- 3 Paper birch---- 3 Red maple------ 3 White oak------ 3	White ash------ 3 Red maple------ 3 Chokecherry---- 2 Hophornbeam---- 2	Silky dogwood-- 5 Witchhazel----- 3 Mapleleaf viburnum------ 2 Serviceberry--- 2	---	Sweet coltsfoot- 3 Canada mayflower------ 3 Hairy solomon's seal----------- 2 Blueberries----- 2 Wild strawberry----- 2 Wintergreen----- 2
430D, 430E------- Mongo	Sugar maple---- 3 American basswood------ 2	---	Serviceberry--- 3 Hawthorns------ 2	---	Large-leaved aster---------- 2 Trilliums------- 2 Wild strawberry----- 2 Rosy twistedstalk--- 2
431B------------- Skeel	Red maple------ 5 Bigtooth aspen- 4 Paper birch---- 4 White oak------ 4	---	Serviceberry--- 4	Brackenfern----- 5	Grasses--------- 5 Wintergreen----- 4 Asters---------- 3
433B:					
Morganlake------	Red maple------ 4 Quaking aspen-- 4 Bigtooth aspen- 3 Paper birch---- 3 White ash------ 3 Red pine------- 3 Northern red oak----------- 3 White oak------ 3 Pin cherry----- 2 Jack pine------ 2 American beech- 2	Quaking aspen-- 5 Red maple------ 3 White ash------ 3 White oak------ 2 Northern red oak----------- 2 Balsam fir----- 1 Bigtooth aspen- 2	Serviceberry--- 4 Witchhazel----- 4 Mapleleaf viburnum------ 4 Silky dogwood-- 2 Hawthorns------ 2	Brackenfern----- 4	Large-leaved aster---------- 4 Wintergreen----- 4 Rosy twistedstalk--- 3 Violets--------- 3 Wild strawberry----- 3 Wood betony----- 3 Bedstraws------- 3 Bunchberry------ 3 Low bush blueberry------ 3 Starflower------ 3 Sedges---------- 3 Grasses--------- 3 Tick clovers---- 3 Trilliums------- 2 Canada mayflower------ 2 Yellow ladyslipper---- 2 Round-leaved pyrolas-------- 2 Baneberries----- 2 Barren strawberry----- 2 Columbine------- 1

See footnote at end of table.

Table 9.--Plant Communities on Selected Soils--Continued

Soil name and map symbol	Extent of major and minor trees*	Extent of seedlings*	Extent of shrubs*	Extent of ferns and clubmoss*	Extent of ground plants*
433B:					
Graycalm	Northern red oak 4 Jack pine 3 Black oak 3 Eastern white pine 3 Bigtooth aspen 2 Quaking aspen 2 Red pine 2 White oak 1	Eastern white pine 3 Quaking aspen 3 Black oak 2 Jack pine 2 Northern red oak 2 Red pine 2 Red maple 1	---	Brackenfern 3	Grasses 4 Low bush blueberry 4 Bearberry 3 Hairgrass 3 Sand cherry 3 Sedges 3 Sweetfern 2 Trailing arbutus 2 Blue cladonia 2
434D:					
Graycalm	Northern red oak 4 Jack pine 3 Black oak 3 Eastern white pine 3 Bigtooth aspen 2 Quaking aspen 2 Red pine 2 White oak 1	Eastern white pine 3 Quaking aspen 3 Black oak 2 Jack pine 2 Northern red oak 2 Red pine 2 Red maple 1	Sand cherry 3	Brackenfern 3	Grasses 4 Low bush blueberry 4 Bearberry 3 Hairgrass 3 Sedges 3 Blue cladonia 2 Sweetfern 2 Trailing arbutus 2
Menominee	Northern red oak 4 Bigtooth aspen 3 Paper birch 3 Red maple 3 White oak 3	White ash 3 Red maple 3 Chokecherry 2 Hophornbeam 2	Silky dogwood 5 Witchhazel 3 Mapleleaf viburnum 2 Serviceberry 2	---	Sweet coltsfoot 3 Canada mayflower 3 Hairy solomon's seal 2 Blueberries 2 Wild strawberry 2 Wintergreen 2

See footnote at end of table.

Table 9.--Plant Communities on Selected Soils--Continued

Soil name and map symbol	Extent of major and minor trees*	Extent of seedlings*	Extent of shrubs*	Extent of ferns and clubmoss*	Extent of ground plants*
434D:					
Morganlake------	Red maple------ 4	Quaking aspen-- 5	Serviceberry--- 4	Brackenfern----- 4	Large-leaved aster---------- 4
	Quaking aspen-- 4	Red maple------ 3	Witchhazel----- 4		Wintergreen----- 4
	Bigtooth aspen- 3	White ash------ 3	Mapleleaf viburnum------ 4		Rosy twistedstalk--- 3
	Paper birch---- 3	White oak------ 2	Silky dogwood-- 2		Violets--------- 3
	White ash------ 3	Northern red oak----------- 2	Hawthorns------ 2		Wild strawberry----- 3
	Red pine------- 3	Balsam fir----- 1			Wood betony----- 3
	Northern red oak----------- 3	Bigtooth aspen- 2			Bedstraws------- 3
	White oak------ 3				Bunchberry------ 3
	Pin cherry----- 2				Low bush blueberry------ 3
	Jack pine------ 2				Starflower------ 3
	American beech- 2				Sedges---------- 3
					Grasses--------- 3
					Tick clovers---- 3
					Trilliums------- 2
					Canada mayflower------ 2
					Yellow ladyslipper---- 2
					Round-leaved pyrolas-------- 2
					Baneberries----- 2
					Barren strawberry----- 2
					Columbine------- 1
441B, 441C:					
Morganlake------	Red maple------ 4	Quaking aspen-- 5	Serviceberry--- 4	Brackenfern----- 4	Large-leaved aster---------- 4
	Quaking aspen-- 4	Red maple------ 3	Witchhazel----- 4		Wintergreen----- 4
	Bigtooth aspen- 3	White ash------ 3	Mapleleaf viburnum------ 4		Rosy twistedstalk--- 3
	Paper birch---- 3	White oak------ 2	Silky dogwood-- 2		Violets--------- 3
	White ash------ 3	Northern red oak----------- 2	Hawthorns------ 2		Wild strawberry----- 3
	Red pine------- 3	Balsam fir----- 1			Wood betony----- 3
	Northern red oak----------- 3	Bigtooth aspen- 2			Bedstraws------- 3
	White oak------ 3				Bunchberry------ 3
	Pin cherry----- 2				Low bush blueberry------ 3
	Jack pine------ 2				Starflower------ 3
	American beech- 2				Sedges---------- 3
					Grasses--------- 3
					Tick clovers---- 3
					Trilliums------- 2
					Canada mayflower------ 2
					Yellow ladyslipper---- 2
					Round-leaved pyrolas-------- 2
					Baneberries----- 2
					Barren strawberry----- 2
					Columbine------- 1

See footnote at end of table.

Table 9.--Plant Communities on Selected Soils--Continued

Soil name and map symbol	Extent of major and minor trees*	Extent of seedlings*	Extent of shrubs*	Extent of ferns and clubmoss*	Extent of ground plants*
441B, 441C:					
Nester	Sugar maple---- 5	White ash------ 4	Witchhazel----- 4	Brackenfern----- 3	Smooth yellow violet--------- 4
	American beech- 4	Red maple------ 4	Serviceberry--- 3	Shield fern----- 2	Hepaticas------- 3
	Red maple------ 4	American beech- 4	Mapleleaf viburnum------ 3	Maidenhair fern- 1	Wild sarsaparilla--- 3
	White ash------ 3	Hemlock-------- 4			Sweet coltsfoot- 3
	Bigtooth aspen- 3	Sugar maple---- 3			Miterworts------ 3
	Northern red oak----------- 3	Hophornbeam---- 3			Currants-------- 2
	Hophornbeam---- 3	American basswood------ 2			Baneberries----- 1
	Quaking aspen-- 2	Eastern white pine---------- 2			
	Paper birch---- 2	Yellow birch--- 1			
	American basswood------ 2				
	Eastern white pine---------- 2				
444B: Kawkawlin	Bigtooth aspen- 4	Northern red oak----------- 3	Serviceberry--- 3	Brackenfern----- 3	Trout lily------ 5
	Northern whitecedar---- 4	Quaking aspen-- 2	Speckled alder- 2		Sedges---------- 4
	Northern red oak----------- 3				Large-leaved aster---------- 4
	Paper birch---- 2				Canada mayflower------ 3
	Black ash------ 1				Bedstraws------- 3
					Bunchberry------ 3
					Horsetails------ 3
					Grasses--------- 3
					Sweet coltsfoot- 3
					Barren strawberry----- 2
					Virginia creeper-------- 2
					Trilliums------- 2
447B: Whittemore	Red maple------ 4	Balsam fir----- 5	Speckled alder- 2	Brackenfern----- 4	Canada mayflower------ 4
	Northern red oak----------- 4	Northern red oak----------- 4			Bunchberry------ 4
	Quaking aspen-- 3	Red maple------ 4			Wintergreen----- 4
	Paper birch---- 3	Paper birch---- 3			Large-leaved aster---------- 3
	Bigtooth aspen- 3	Bigtooth aspen- 2			Bedstraws------- 3
	Balsam fir----- 2				Canada blueberry------ 3
	Black spruce--- 1				Starflower------ 3
					Low bush blueberry------ 3
					Currants-------- 3
					Violets--------- 3
					Grasses--------- 3
					Sedges---------- 3
					Sheep laurel---- 3
					Sweet cicely---- 2
					Wild sarsaparilla--- 1

See footnote at end of table.

Table 9.--Plant Communities on Selected Soils--Continued

Soil name and map symbol	Extent of major and minor trees*	Extent of seedlings*	Extent of shrubs*	Extent of ferns and clubmoss*	Extent of ground plants*
449A------------- Kokosing	Red maple------ 4 Bigtooth aspen- 4 Paper birch---- 4 Eastern white pine---------- 3 Black ash------ 2	Red maple------ 4 Black ash------ 3 Black oak------ 2	---	Brackenfern----- 3	Blueberries----- 4 Canada mayflower------ 3 Wintergreen----- 3 Bunchberry------ 3

* The extent of the plants listed is expressed as a number representing the amount of ground covered by the plants. The number 1 means that the plant covers less than 1 percent of the surface, 2 means 1 to 5 percent, 3 means 5 to 25 percent, 4 means 25 to 50 percent, 5 means 50 to 75 percent, 6 means 75 to 95 percent, and 7 means 95 to 100 percent.

Table 10.--Windbreaks and Environmental Plantings

(Only the soils suitable for windbreaks and environmental plantings are listed. Absence of an entry indicates that trees generally do not grow to the given height on that soil)

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- 8-15	16-25	26-35	>35
12B:				
Tawas	Black spruce, silky dogwood, nannyberry viburnum, common ninebark, redosier dogwood, arrowwood.	Northern whitecedar, green ash.	---	---
Au Gres	American cranberrybush, Amur maple, common ninebark, nannyberry viburnum.	White spruce, jack pine, Manchurian crabapple.	Norway spruce, green ash, eastern white pine.	Imperial Carolina poplar.
13:				
Tawas	Black spruce, silky dogwood, nannyberry viburnum, common ninebark, redosier dogwood, arrowwood.	Northern whitecedar, green ash.	---	---
Lupton.				
15A:				
Croswell	Amur maple, lilac, eastern redcedar, Siberian peashrub.	Red pine, jack pine	Eastern white pine	---
Au Gres.				
16B Graycalm	Siberian peashrub, lilac, eastern redcedar, Amur maple.	Red pine, jack pine	Eastern white pine	---
17B Croswell	Amur maple, lilac, eastern redcedar, Siberian peashrub.	Red pine, jack pine	Eastern white pine	---
18A Au Gres	American cranberrybush, Amur maple, common ninebark, nannyberry viburnum.	White spruce, jack pine, Manchurian crabapple.	Norway spruce, green ash, eastern white pine.	Imperial Carolina poplar.
25B, 25C Kent	Northern whitecedar, nannyberry viburnum, silky dogwood, American cranberrybush, Amur maple, lilac, common ninebark.	Norway spruce, white spruce, eastern white pine, red maple.	Green ash	---
26B Cublake	Siberian peashrub, lilac, smooth sumac, eastern redcedar, staghorn sumac.	Eastern white pine, red pine, jack pine, Manchurian crabapple, Austrian pine.	---	---

Table 10.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	8-15	16-25	26-35	>35
27A: Tacoda	Silky dogwood, American cranberrybush, lilac, nannyberry viburnum.	Siberian crabapple, white spruce, eastern redcedar.	Eastern white pine, green ash, jack pine, Norway spruce.	Imperial Carolina poplar.
28B: East Lake	Siberian peashrub, Amur maple, eastern redcedar, lilac.	Red pine, jack pine	Eastern white pine	---
39B, 39C: Glennie	Lilac, nannyberry viburnum, Roselow sargent crabapple, Amur maple, silky dogwood.	Norway spruce, red pine, Manchurian crabapple, white spruce, eastern white pine.	Green ash	---
40A: Sprinkler	American cranberrybush, lilac, Roselow sargent crabapple, Amur maple, silky dogwood.	Norway spruce, red pine, Manchurian crabapple, white spruce, eastern white pine.	Green ash	---
47D: Graycalm	Siberian peashrub, lilac, eastern redcedar, Amur maple.	Red pine, jack pine	Eastern white pine	---
53B, 53C: Negwegon	Lilac, nannyberry viburnum, Roselow sargent crabapple, Amur maple, silky dogwood, Siberian peashrub.	Manchurian crabapple, white spruce.	Norway spruce, red pine, green ash, eastern white pine.	---
54A: Algonquin	Lilac, Roselow sargent crabapple, silky dogwood, American cranberrybush, Amur maple, Siberian peashrub.	White spruce, blue spruce, Manchurian crabapple.	Norway spruce, eastern white pine, green ash.	---
55: Springport	American cranberrybush, lilac, Roselow sargent crabapple, Amur maple, silky dogwood.	Norway spruce, red pine, Manchurian crabapple, white spruce, eastern white pine.	Green ash	---
56C: Nester	Arrowwood, lilac, common ninebark, nannyberry viburnum, Siberian peashrub, silky dogwood.	White spruce, blue spruce, Manchurian crabapple.	Red pine, green ash, eastern white pine.	---
57B: Kawkawlin	Roselow sargent crabapple, silky dogwood, Amur maple, lilac, American cranberrybush, nannyberry viburnum, northern whitecedar, common ninebark.	White spruce, red pine, Norway spruce, eastern white pine.	---	---

Table 10.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- 8-15	16-25	26-35	>35
58A:				
Wakeley.				
Allendale	Northern whitecedar, American cranberrybush, Roselow sargent crabapple, lilac, nannyberry viburnum.	White spruce, Manchurian crabapple, blue spruce.	Eastern white pine, red maple, Norway spruce.	---
59B:				
Algonquin	Lilac, Roselow sargent crabapple, silky dogwood, American cranberrybush, Amur maple, Siberian peashrub.	White spruce, blue spruce, Manchurian crabapple.	Norway spruce, eastern white pine, green ash.	---
Springport.				
62A Allendale	Northern whitecedar, American cranberrybush, Roselow sargent crabapple, lilac, nannyberry viburnum.	White spruce, Manchurian crabapple, blue spruce.	Eastern white pine, red maple, Norway spruce.	---
71 Tawas	Black spruce, silky dogwood, nannyberry viburnum, common ninebark, redosier dogwood, arrowwood.	Northern whitecedar, green ash.	---	---
81B, 81D, 81E Grayling	Lilac, silver buffaloberry, Siberian peashrub, smooth sumac, eastern redcedar, staghorn sumac.	Jack pine, eastern white pine, red pine.	---	---
84B Zimmerman	Eastern redcedar, Siberian crabapple, Amur privet, lilac, silky dogwood, Amur maple, Siberian peashrub.	---	Red pine, eastern white pine, jack pine.	---
93B:				
Tacoda	Silky dogwood, American cranberrybush, lilac, nannyberry viburnum.	Siberian crabapple, white spruce, eastern redcedar.	Eastern white pine, green ash, jack pine, Norway spruce.	Imperial Carolina poplar.
Wakeley.				
97 Colonville	Nannyberry viburnum, Norway spruce, Siberian peashrub, Washington hawthorn, silver buffaloberry, staghorn sumac.	Lilac, blue spruce	Green ash	Imperial Carolina poplar.

Table 10.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- 8-15	16-25	26-35	>35
100D, 100E-------- Curtisville	Arrowwood, lilac, nannyberry viburnum, common ninebark, Siberian peashrub.	Blue spruce, white spruce, Manchurian crabapple.	Red pine, green ash, eastern white pine.	---
103B, 103C-------- Nester	Arrowwood, lilac, common ninebark, nannyberry viburnum, Siberian peashrub, silky dogwood.	White spruce, blue spruce, Manchurian crabapple.	Red pine, green ash, eastern white pine.	---
114A-------------- Ingalls	Northern whitecedar, American cranberrybush, lilac, common ninebark, Roselow sargent crabapple, Siberian peashrub.	White spruce, Norway spruce, Manchurian crabapple, green ash.	Eastern white pine----	---
120B, 120C-------- Morganlake	Northern whitecedar, American cranberrybush, lilac, nannyberry viburnum, eastern redcedar.	White spruce, green ash, Norway spruce, Black Hills spruce, Manchurian crabapple.	Eastern white pine----	Imperial Carolina poplar.
123D-------------- Klacking	Lilac, common ninebark, Roselow sargent crabapple, nannyberry viburnum, Amur maple.	White spruce, Siberian crabapple, eastern redcedar.	Norway spruce, eastern white pine, red pine.	Imperial Carolina poplar.
159A-------------- Finch	Northern whitecedar, silky dogwood, American cranberrybush, common ninebark, nannyberry viburnum, Amur maple.	Jack pine, Siberian crabapple.	White spruce, Norway spruce, eastern white pine, green ash.	---
197A-------------- Gladwin	Lilac, American cranberrybush, northern whitecedar, nannyberry viburnum, Roselow sargent crabapple, Amur maple, silky dogwood.	White spruce, Manchurian crabapple.	Eastern white pine, green ash.	Imperial Carolina poplar.
210B, 210C, 210D, 210E------------- Grayling	Lilac, silver buffaloberry, Siberian peashrub, smooth sumac, eastern redcedar, staghorn sumac.	Jack pine, eastern white pine, red pine.	---	---

Table 10.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- 8-15	16-25	26-35	>35
223B, 223C:				
Graycalm	Siberian peashrub, lilac, eastern redcedar, Amur maple.	Red pine, jack pine	Eastern white pine	---
Grayling	Lilac, silver buffaloberry, Siberian peashrub, smooth sumac, eastern redcedar, staghorn sumac.	Jack pine, eastern white pine, red pine.	---	---
223D, 223E:				
Graycalm.				
Grayling	Lilac, silver buffaloberry, Siberian peashrub, smooth sumac, eastern redcedar, staghorn sumac.	Jack pine, eastern white pine, red pine.	---	---
224B Croswell	Amur maple, lilac, eastern redcedar, Siberian peashrub.	Red pine, jack pine	Eastern white pine	---
264A Allendale	Northern whitecedar, American cranberrybush, Roselow sargent crabapple, lilac, nannyberry viburnum.	White spruce, Manchurian crabapple, blue spruce.	Eastern white pine, red maple, Norway spruce.	---
265B:				
Eutroboralfs.				
Allendale	Northern whitecedar, American cranberrybush, Roselow sargent crabapple, lilac, nannyberry viburnum.	White spruce, Manchurian crabapple, blue spruce.	Eastern white pine, red maple, Norway spruce.	---
343 Sims	Northern whitecedar, nannyberry viburnum, silky dogwood, lilac, arrowwood, common ninebark, American cranberrybush.	Norway spruce, Manchurian crabapple, eastern white pine, white spruce.	Green ash	---
367A:				
Whittemore	Northern whitecedar, American cranberrybush, common ninebark, nannyberry viburnum, late lilac.	Norway spruce, red maple, Manchurian crabapple, white spruce, green ash.	Eastern white pine	---
Springport.				

Table 10.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- 8-15	16-25	26-35	>35
368A:				
Au Gres	American cranberrybush, Amur maple, common ninebark, nannyberry viburnum.	White spruce, jack pine, Manchurian crabapple.	Norway spruce, green ash, eastern white pine.	Imperial Carolina poplar.
Deford.				
378A Algonquin	Lilac, Roselow sargent crabapple, silky dogwood, American cranberrybush, Amur maple, Siberian peashrub.	White spruce, blue spruce, Manchurian crabapple.	Norway spruce, eastern white pine, green ash.	---
379A:				
Algonquin	Lilac, Roselow sargent crabapple, silky dogwood, American cranberrybush, Amur maple, Siberian peashrub.	White spruce, blue spruce, Manchurian crabapple.	Norway spruce, eastern white pine, green ash.	---
Springport.				
383B Wurtsmith	Amur maple, lilac, eastern redcedar, Siberian peashrub.	Red pine, jack pine	Eastern white pine	---
403B, 403C Iargo	Amur maple, lilac, nannyberry viburnum, Roselow sargent crabapple, Siberian peashrub, silky dogwood.	White spruce, green ash, Manchurian crabapple.	Balsam fir, eastern white pine, red pine.	---
404A Manary	American cranberrybush, northern whitecedar, common ninebark, lilac, nannyberry viburnum.	White spruce, Manchurian crabapple.	Eastern white pine, Norway spruce, green ash, red pine.	---
405B:				
Manary	American cranberrybush, northern whitecedar, common ninebark, lilac, nannyberry viburnum.	White spruce, Manchurian crabapple.	Eastern white pine, Norway spruce, green ash, red pine.	---
Iargo	Amur maple, lilac, nannyberry viburnum, Roselow sargent crabapple, Siberian peashrub, silky dogwood.	White spruce, green ash, Manchurian crabapple.	Balsam fir, eastern white pine, red pine.	---

Table 10.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- 8-15	16-25	26-35	>35
406A: Winterfield	American cranberrybush, lilac, Amur maple, silky dogwood, common ninebark, nannyberry viburnum.	White spruce, Siberian crabapple, northern whitecedar.	Eastern white pine, Norway spruce, green ash.	---
408: Sims	Northern whitecedar, nannyberry viburnum, silky dogwood, lilac, arrowwood, common ninebark, American cranberrybush.	Norway spruce, Manchurian crabapple, eastern white pine, white spruce.	Green ash	---
409A:				
Finch	Northern whitecedar, silky dogwood, American cranberrybush, common ninebark, nannyberry viburnum, Amur maple.	Jack pine, Siberian crabapple.	White spruce, Norway spruce, eastern white pine, green ash.	---
Deford.				
Au Gres.				
410B:				
Proper.				
Finch	Northern whitecedar, silky dogwood, American cranberrybush, common ninebark, nannyberry viburnum, Amur maple.	Jack pine, Siberian crabapple.	White spruce, Norway spruce, eastern white pine, green ash.	---
Deford.				
425D: Hottis	American cranberrybush, silky dogwood, Amur maple, northern whitecedar, lilac, nannyberry viburnum, common ninebark.	Norway spruce, eastern white pine, white spruce, red maple.	Green ash	---
426B, 426C: Coppler	Amur maple, lilac, eastern redcedar, Siberian peashrub, northern whitecedar.	White spruce, jack pine, Manchurian crabapple, Norway spruce.	Red pine, eastern white pine.	Imperial Carolina poplar.
429D: Menominee	Sargent crabapple, nannyberry viburnum, Amur maple, eastern redcedar.	Red pine, Norway spruce, white spruce, green ash, Siberian crabapple.	Eastern white pine	Imperial Carolina poplar.
430D, 430E: Mongo	Lilac, nannyberry viburnum, Roselow sargent crabapple, Amur maple, silky dogwood, Siberian peashrub.	Manchurian crabapple, white spruce.	Norway spruce, red pine, green ash, eastern white pine.	---

Table 10.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- 8-15	16-25	26-35	>35
431B-------------- Skeel	Lilac, nannyberry viburnum, northern whitecedar, eastern redcedar, American cranberrybush.	White spruce, green ash, Norway spruce, Black Hills spruce, Manchurian crabapple.	Eastern white pine----	Imperial Carolina poplar.
432B:				
Wurtsmith--------	Amur maple, lilac, eastern redcedar, Siberian peashrub.	Red pine, jack pine---	Eastern white pine----	---
Meehan.				
433B:				
Morganlake-------	Northern whitecedar, American cranberrybush, lilac, nannyberry viburnum, eastern redcedar.	White spruce, green ash, Norway spruce, Black Hills spruce, Manchurian crabapple.	Eastern white pine----	Imperial Carolina poplar.
Graycalm.				
434D:				
Graycalm.				
Menominee--------	Sargent crabapple, nannyberry viburnum, Amur maple, eastern redcedar.	Red pine, Norway spruce, white spruce, green ash, Siberian crabapple.	Eastern white pine----	Imperial Carolina poplar.
Morganlake-------	Northern whitecedar, American cranberrybush, lilac, nannyberry viburnum, eastern redcedar.	White spruce, green ash, Norway spruce, Black Hills spruce, Manchurian crabapple.	Eastern white pine----	Imperial Carolina poplar.
435B:				
Skeel------------	Lilac, nannyberry viburnum, northern whitecedar, eastern redcedar, American cranberrybush.	White spruce, green ash, Norway spruce, Black Hills spruce, Manchurian crabapple.	Eastern white pine----	Imperial Carolina poplar.
Algonquin--------	Lilac, Roselow sargent crabapple, silky dogwood, American cranberrybush, Amur maple, Siberian peashrub.	White spruce, blue spruce, Manchurian crabapple.	Norway spruce, eastern white pine, green ash.	---
Aquepts.				
436A:				
Manary-----------	American cranberrybush, northern whitecedar, common ninebark, lilac, nannyberry viburnum.	White spruce, Manchurian crabapple.	Eastern white pine, Norway spruce, green ash, red pine.	---

Table 10.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- 8-15	16-25	26-35	>35
436A:				
Whittemore	Northern whitecedar, American cranberrybush, common ninebark, nannyberry viburnum, late lilac.	Norway spruce, red maple, Manchurian crabapple, white spruce, green ash.	Eastern white pine	---
Springport.				
437D:				
Wurtsmith	Amur maple, lilac, eastern redcedar, Siberian peashrub.	Red pine, jack pine	Eastern white pine	---
Meehan.				
Deer Park.				
438C:				
Meehan.				
Tawas.				
Wurtsmith	Amur maple, lilac, eastern redcedar, Siberian peashrub.	Red pine, jack pine	Eastern white pine	---
440B:				
Kawkawlin	Roselow sargent crabapple, silky dogwood, Amur maple, lilac, American cranberrybush, nannyberry viburnum, northern whitecedar, common ninebark.	White spruce, red pine, Norway spruce, eastern white pine.	---	---
Sims	Northern whitecedar, nannyberry viburnum, silky dogwood, lilac, arrowwood, common ninebark, American cranberrybush.	Norway spruce, Manchurian crabapple, eastern white pine, white spruce.	Green ash	---
441B, 441C:				
Morganlake	Northern whitecedar, American cranberrybush, lilac, nannyberry viburnum, eastern redcedar.	White spruce, green ash, Norway spruce, Black Hills spruce, Manchurian crabapple.	Eastern white pine	Imperial Carolina poplar.
Nester	Arrowwood, lilac, common ninebark, nannyberry viburnum, Siberian peashrub, silky dogwood.	White spruce, blue spruce, Manchurian crabapple.	Red pine, green ash, eastern white pine.	---
442D, 442E:				
Menominee	Sargent crabapple, nannyberry viburnum, Amur maple, eastern redcedar.	Red pine, Norway spruce, white spruce, green ash, Siberian crabapple.	Eastern white pine	Imperial Carolina poplar.

Table 10.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- 8-15	16-25	26-35	>35
442D, 442E:				
Curtisville	Arrowwood, lilac, nannyberry viburnum, common ninebark, Siberian peashrub.	Blue spruce, white spruce, Manchurian crabapple.	Red pine, green ash, eastern white pine.	---
443B:				
Kawkawlin	Roselow sargent crabapple, silky dogwood, Amur maple, lilac, American cranberrybush, nannyberry viburnum, northern whitecedar, common ninebark.	White spruce, red pine, Norway spruce, eastern white pine.	---	---
Allendale	Northern whitecedar, American cranberrybush, Roselow sargent crabapple, lilac, nannyberry viburnum.	White spruce, Manchurian crabapple, blue spruce.	Eastern white pine, red maple, Norway spruce.	---
Aquepts.				
444B: Kawkawlin	Roselow sargent crabapple, silky dogwood, Amur maple, lilac, American cranberrybush, nannyberry viburnum, northern whitecedar, common ninebark.	White spruce, red pine, Norway spruce, eastern white pine.	---	---
446B:				
Wurtsmith	Amur maple, lilac, eastern redcedar, Siberian peashrub.	Red pine, jack pine	Eastern white pine	---
Meehan.				
Urban land.				
447A: Whittemore	Northern whitecedar, American cranberrybush, common ninebark, nannyberry viburnum, late lilac.	Norway spruce, red maple, Manchurian crabapple, white spruce, green ash.	Eastern white pine	---
449A: Kokosing	Common ninebark, northern whitecedar, American cranberrybush, nannyberry viburnum, lilac, silky dogwood.	White spruce, Manchurian crabapple.	Green ash, eastern white pine, Norway spruce.	Imperial Carolina poplar.

Table 11.--Recreational Development

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
12B:					
Tawas	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Au Gres	Severe: wetness, too sandy, too acid.	Severe: wetness, too sandy, too acid.	Severe: too sandy, wetness, too acid.	Severe: wetness, too sandy.	Severe: too acid, wetness.
13:					
Tawas	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Lupton	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
15A:					
Croswell	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy.	Severe: too acid.
Au Gres	Severe: wetness, too sandy, too acid.	Severe: wetness, too sandy, too acid.	Severe: too sandy, wetness, too acid.	Severe: wetness, too sandy.	Severe: too acid, wetness.
16B Graycalm	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy.	Severe: too acid, droughty.
16D Graycalm	Severe: slope, too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: too sandy.	Severe: too acid, droughty, slope.
17B Croswell	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy.	Severe: too acid.
18A Au Gres	Severe: wetness, too sandy, too acid.	Severe: wetness, too sandy, too acid.	Severe: too sandy, wetness, too acid.	Severe: wetness, too sandy.	Severe: too acid, wetness.
19 Leafriver	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
25B Kent	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
25C Kent	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
26B: Cublake	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy.	Severe: too acid, droughty.
27A: Tacoda	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness.
28B: East Lake	Severe: too sandy.	Severe: too sandy.	Moderate: slope, small stones.	Severe: too sandy.	Moderate: large stones, droughty.
39B: Glennie	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight	Moderate: large stones, droughty.
39C: Glennie	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: large stones, droughty, slope.
40A: Sprinkler	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
47D: Graycalm	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: too sandy.	Severe: too acid, droughty.
47F: Graycalm	Severe: slope, too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: too sandy, slope.	Severe: too acid, droughty, slope.
53B: Negwegon	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
53C: Negwegon	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Severe: erodes easily.	Moderate: wetness, slope.
54A: Algonquin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
55: Springport	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.
56C: Nester	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
57B: Kawkawlin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
58A: Wakeley	Severe: ponding, percs slowly, excess humus.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, excess humus.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
58A:					
Allendale	Severe: wetness, percs slowly, too sandy.	Severe: wetness, too sandy, percs slowly.	Severe: too sandy, wetness, percs slowly.	Severe: wetness, too sandy.	Severe: wetness.
59B:					
Algonquin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Springport	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.
62A: Allendale	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
70: Lupton	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
71: Tawas	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
72: Dorval	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
75B: Rubicon	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
75D: Rubicon	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty.
75E, 75F: Rubicon	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.	Severe: droughty, slope.
77: Rollaway	Severe: flooding, ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding, flooding.	Severe: ponding, excess humus.	Severe: ponding, flooding, excess humus.
78. Pits					
81B: Grayling	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy.	Severe: too acid, droughty.
81D: Grayling	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: too sandy.	Severe: too acid, droughty.
81E: Grayling	Severe: slope, too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: too sandy, slope.	Severe: too acid, droughty, slope.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
82C, 82F: Udorthents	Variable	Variable	Variable	Variable	Variable.
83B: Udipsamments	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
84B: Zimmerman	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
86:					
Histosols	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Aquents	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
93B:					
Tacoda	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness.
Wakeley	Severe: ponding, percs slowly, excess humus.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, excess humus.
97: Colonville	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
100D: Curtisville	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
100E: Curtisville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
103B: Nester	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
103C: Nester	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
108B: Selkirk	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
114A: Ingalls	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness.
120B: Morganlake	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy.	Severe: too acid.
120C: Morganlake	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: too sandy.	Severe: too acid.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
123D------------------ Klacking	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: droughty, slope, too sandy.
124------------------- Evart	Severe: flooding, wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness, flooding.	Severe: wetness, too sandy.	Severe: wetness, flooding.
127------------------- Cathro	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
128------------------- Dawson	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
130------------------- Grousehaven	Severe: ponding, percs slowly, excess humus.	Severe: ponding, excess humus, percs slowly.	Severe: excess humus, ponding, percs slowly.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
159A------------------ Finch	Severe: wetness, too sandy, cemented pan.	Severe: wetness, too sandy, too acid.	Severe: too sandy, wetness, cemented pan.	Severe: wetness, too sandy.	Severe: too acid, wetness, droughty.
182. Pits					
197A------------------ Gladwin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
209B------------------ Grayling	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
209C------------------ Grayling	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty.
209D------------------ Grayling	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty, slope.
210B------------------ Grayling	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy.	Severe: too acid, droughty.
210C------------------ Grayling	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: too sandy.	Severe: too acid, droughty.
210D------------------ Grayling	Severe: slope, too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: too sandy.	Severe: too acid, droughty, slope.
210E------------------ Grayling	Severe: slope, too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: too sandy, slope.	Severe: too acid, droughty, slope.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
211B: Grayling	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
212B: Grayling	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
213B: Graycalm	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy.	Severe: too acid, droughty.
214B: Typic Udipsamments	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
215B, 216B, 220B: Typic Udipsamments	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
220D: Typic Udipsamments	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: slope.
220E: Typic Udipsamments	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.	Severe: slope.
221B: Typic Udipsamments	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
221C: Typic Udipsamments	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: droughty, slope, too sandy.
221D: Typic Udipsamments	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: slope.
221E: Typic Udipsamments	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.	Severe: slope.
222B: Typic Udipsamments	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
223B:					
Graycalm	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy.	Severe: too acid, droughty.
Grayling	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy.	Severe: too acid, droughty.
223C:					
Graycalm	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: too sandy.	Severe: too acid, droughty.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
223C:					
Grayling	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: too sandy.	Severe: too acid, droughty.
223D:					
Graycalm	Severe: slope, too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: too sandy.	Severe: too acid, droughty, slope.
Grayling	Severe: slope, too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: too sandy.	Severe: too acid, droughty, slope.
223E:					
Graycalm	Severe: slope, too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: too sandy, slope.	Severe: too acid, droughty, slope.
Grayling	Severe: slope, too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: too sandy, slope.	Severe: too acid, droughty, slope.
224B Croswell	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy.	Severe: too acid.
225B Entic Haplorthods	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
225C Entic Haplorthods	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: droughty, slope, too sandy.
231D:					
Entic Haplorthods	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: slope.
Alfic Haplorthods	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: slope.
231E:					
Entic Haplorthods	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.	Severe: slope.
Alfic Haplorthods	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.	Severe: slope.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
232B:					
Entic Haplorthods----	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
Alfic Haplorthods----	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
233B:					
Alfic Haplorthods----	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
Entic Haplorthods----	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
233C:					
Alfic Haplorthods----	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: droughty, slope, too sandy.
Entic Haplorthods----	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: droughty, slope, too sandy.
233D:					
Alfic Haplorthods----	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: slope.
Entic Haplorthods----	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: slope.
235B:					
Alfic Haplorthods, sandy over loamy----	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
Alfic Haplorthods, sandy---------------	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
235C:					
Alfic Haplorthods, sandy over loamy----	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: droughty, slope, too sandy.
Alfic Haplorthods, sandy---------------	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: droughty, slope, too sandy.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
236B: Arenic Eutroboralfs	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
237B: Eutroboralfs	Slight	Slight	Moderate: slope.	Slight	Slight.
237D: Eutroboralfs	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
254A: Borosaprists.					
Fluvaquents	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
Aquic Udipsamments	Severe: flooding, wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness.
262A: Au Gres	Severe: wetness, too sandy, too acid.	Severe: wetness, too sandy, too acid.	Severe: too sandy, wetness, too acid.	Severe: wetness, too sandy.	Severe: too acid, wetness.
263A: Argic Endoaquods	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
264A: Allendale	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
265B:					
Eutroboralfs	Slight	Slight	Moderate: slope.	Slight	Slight.
Allendale	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
266A: Typic Duraquods	Severe: too sandy, cemented pan.	Severe: too sandy, cemented pan.	Severe: too sandy, cemented pan.	Severe: too sandy.	Severe: droughty, cemented pan.
272: Endoaquods.					
Fluvaquents	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
273:					
Leafriver	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Wakeley	Severe: ponding, percs slowly.	Severe: ponding, too sandy, percs slowly.	Severe: too sandy, ponding, percs slowly.	Severe: ponding, too sandy.	Severe: ponding.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
274: Typic Endoaquods	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
280:					
Aquents	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Histosols	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
281, 282: Borosaprists	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
343: Sims	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
355E:					
Crowell	Severe: slope, too sandy, cemented pan.	Severe: slope, too sandy, too acid.	Severe: slope, too sandy, cemented pan.	Severe: too sandy.	Severe: too acid, slope, cemented pan.
Proper	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty.
356E:					
Aquepts	Severe: slope, wetness.	Severe: slope, wetness.	Severe: slope, wetness.	Severe: wetness, slope.	Severe: wetness, slope.
Histosols	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Fluvaquents	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
357B:					
Udipsamments	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty.
Urban land	Variable	Variable	Variable	Variable	Variable.
360: Wakeley	Severe: ponding, percs slowly, excess humus.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, excess humus.
367A:					
Whittemore	Severe: wetness, too sandy, cemented pan.	Severe: wetness, too sandy, cemented pan.	Severe: too sandy, wetness, cemented pan.	Severe: wetness, too sandy.	Severe: wetness, droughty, cemented pan.
Springport	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
368A:					
Au Gres	Severe: wetness, too sandy, too acid.	Severe: wetness, too sandy, too acid.	Severe: too sandy, wetness, too acid.	Severe: wetness, too sandy.	Severe: too acid, wetness.
Deford	Severe: ponding, too acid.	Severe: ponding, too acid.	Severe: ponding, too acid.	Severe: ponding.	Severe: too acid, ponding, excess humus.
369 Deford	Severe: ponding, too acid.	Severe: ponding, too acid.	Severe: ponding, too acid.	Severe: ponding.	Severe: too acid, ponding, excess humus.
370A McIvor	Severe: wetness, too sandy, cemented pan.	Severe: wetness, too sandy, too acid.	Severe: too sandy, wetness, cemented pan.	Severe: wetness, too sandy.	Severe: too acid, wetness, droughty.
371 Springport	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.
372B:					
Proper	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
Leafriver	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
375 Kanotin	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
377 Wabun	Severe: ponding, too sandy.	Severe: ponding, too sandy.	Severe: too sandy, ponding.	Severe: ponding, too sandy.	Severe: ponding.
378A Algonquin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, too clayey.
379A:					
Algonquin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, too clayey.
Springport	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.
380. Access denied					
381A:					
McIvor	Severe: wetness, too sandy, cemented pan.	Severe: wetness, too sandy, too acid.	Severe: too sandy, wetness, cemented pan.	Severe: wetness, too sandy.	Severe: too acid, wetness, droughty.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
381A:					
Wakeley	Severe: ponding, percs slowly, excess humus.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, excess humus.
382B Proper	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
383B Wurtsmith	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
392 Caffey	Severe: ponding.	Severe: ponding, too sandy.	Severe: too sandy, ponding.	Severe: ponding, too sandy.	Severe: ponding.
403B Iargo	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
403C Iargo	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
404A Manary	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
405B:					
Manary	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Iargo	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
406A Winterfield	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
407 Lacota	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
408 Sims	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
409A:					
Finch	Severe: wetness, too sandy, cemented pan.	Severe: wetness, too sandy, too acid.	Severe: too sandy, wetness, cemented pan.	Severe: wetness, too sandy.	Severe: too acid, wetness, droughty.
Deford	Severe: ponding, too acid.	Severe: ponding, too acid.	Severe: ponding, too acid.	Severe: ponding.	Severe: too acid, ponding, excess humus.
Au Gres	Severe: wetness, too sandy, too acid.	Severe: wetness, too sandy, too acid.	Severe: too sandy, wetness, too acid.	Severe: wetness, too sandy.	Severe: too acid, wetness.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
410B:					
Proper	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
Finch	Severe: wetness, too sandy, cemented pan.	Severe: wetness, too sandy, too acid.	Severe: too sandy, wetness, cemented pan.	Severe: wetness, too sandy.	Severe: too acid, wetness, droughty.
Deford	Severe: ponding, too acid.	Severe: ponding, too acid.	Severe: ponding, too acid.	Severe: ponding.	Severe: too acid, ponding, excess humus.
411A Meehan	Severe: wetness, too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy, wetness, too acid.	Severe: too sandy.	Severe: too acid.
425D Hottis	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
426B Coppler	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Moderate: large stones, droughty.
426C Coppler	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: large stones, droughty, slope.
427 Tonkey	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
429D Menominee	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy, too acid.	Severe: too sandy.	Severe: slope.
430D Mongo	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
430E Mongo	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
431B Skeel	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Moderate: wetness, too sandy.	Severe: cemented pan.
432B:					
Wurtsmith	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
Meehan	Severe: wetness, too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy, wetness, too acid.	Severe: too sandy.	Severe: too acid.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
433B:					
Morganlake	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy.	Severe: too acid.
Graycalm	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy.	Severe: too acid, droughty.
434D:					
Graycalm	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: too sandy.	Severe: too acid, droughty.
Menominee	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy, too acid.	Severe: too sandy.	Severe: slope.
Morganlake	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: too sandy.	Severe: too acid.
435B:					
Skeel	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Moderate: wetness, too sandy.	Severe: cemented pan.
Algonquin	Severe: wetness, percs slowly, too clayey.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness, percs slowly.	Severe: wetness, too clayey.	Severe: wetness, too clayey.
Aquepts	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
436A:					
Manary	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Whittemore	Severe: wetness, too sandy, cemented pan.	Severe: wetness, too sandy, cemented pan.	Severe: too sandy, wetness, cemented pan.	Severe: wetness, too sandy.	Severe: wetness, droughty, cemented pan.
Springport	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.
437D:					
Wurtsmith	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
Meehan	Severe: wetness, too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy, wetness, too acid.	Severe: too sandy.	Severe: too acid.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
437D:					
Deer Park	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: too sandy.	Severe: too acid, droughty.
438C:					
Meehan	Severe: wetness, too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy, wetness, too acid.	Severe: too sandy.	Severe: too acid.
Tawas	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Wurtsmith	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
439D Deer Park	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: too sandy.	Severe: too acid, droughty.
440B:					
Kawkawlin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Sims	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
441B:					
Morganlake	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy.	Severe: too acid.
Nester	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
441C:					
Morganlake	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: too sandy.	Severe: too acid.
Nester	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
442D:					
Menominee	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy, too acid.	Severe: too sandy.	Severe: slope.
Curtisville	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
442E:					
Menominee	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy, too acid.	Severe: too sandy, slope.	Severe: slope.
Curtisville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
443B:					
Kawkawlin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Allendale	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
Aquepts	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
444B Kawkawlin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
445A Corsair	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
446B:					
Wurtsmith	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
Meehan	Severe: wetness, too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy, wetness, too acid.	Severe: too sandy.	Severe: too acid.
Urban land	Variable	Variable	Variable	Variable	Variable.
447A Whittemore	Severe: wetness, too sandy, cemented pan.	Severe: wetness, too sandy, cemented pan.	Severe: too sandy, wetness, cemented pan.	Severe: wetness, too sandy.	Severe: wetness, droughty, cemented pan.
448A:					
Meehan	Severe: wetness, too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy, wetness, too acid.	Severe: too sandy.	Severe: too acid.
Tawas	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
449A Kokosing	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness.

Table 12.--Wildlife Habitat

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
12B:										
Tawas	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Au Gres	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
13:										
Tawas	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Lupton	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
15A:										
Croswell	Poor	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
Au Gres	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
16B, 16D Graycalm	Poor	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
17B Croswell	Poor	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
18A Au Gres	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
19 Leafriver	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
25B Kent	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
25C Kent	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
26B Cublake	Poor	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
27A Tacoda	Poor	Fair	Good	Good	Good	Poor	Fair	Fair	Good	Poor.
28B East Lake	Poor	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
39B Glennie	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Very poor.
39C Glennie	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
40A Sprinkler	Fair	Good	Good	Fair	Fair	Fair	Fair	Good	Fair	Fair.
47D Graycalm	Poor	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
47F Graycalm	Very poor.	Poor	Fair	Good	Good	Very poor.	Very poor.	Very poor.	Good	Very poor.

Table 12.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
53B---------------- Negwegon	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
53C---------------- Negwegon	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
54A---------------- Algonquin	Fair	Good	Good	Good	Good	Good	Fair	Good	Good	Fair.
55----------------- Springport	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
56C---------------- Nester	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
57B---------------- Kawkawlin	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
58A:										
Wakeley-----------	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
Allendale---------	Fair	Fair	Good	Good	Good	Poor	Fair	Fair	Good	Poor.
59B:										
Algonquin---------	Good	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
Springport--------	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
62A---------------- Allendale	Fair	Fair	Good	Good	Good	Poor	Fair	Fair	Good	Poor.
70----------------- Lupton	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
71----------------- Tawas	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
72----------------- Dorval	Very poor.	Very poor.	Very poor.	Poor	Poor	Good	Good	Very poor.	Poor	Good.
75B---------------- Rubicon	Poor	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
75D---------------- Rubicon	Poor	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
75E, 75F----------- Rubicon	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
77----------------- Rollaway	Very poor.	Poor	Poor	Fair	Fair	Good	Good	Poor	Fair	Good.
78. Pits										
81B---------------- Grayling	Poor	Poor	Fair	Poor	Poor	Poor	Very poor.	Poor	Poor	Very poor.
81D---------------- Grayling	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.

Table 12.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
81E: Grayling	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
82C, 82F. Udorthents										
83B. Udipsamments										
84B: Zimmerman	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
86:										
Histosols.										
Aquents.										
93B:										
Tacoda	Poor	Fair	Good	Good	Good	Poor	Fair	Fair	Good	Poor.
Wakeley	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
97: Colonville	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
100D: Curtisville	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
100E: Curtisville	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
103B, 103C: Nester	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
108B: Selkirk	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
114A: Ingalls	Fair	Fair	Good	Fair	Fair	Fair	Fair	Fair	Fair	Fair.
120B, 120C: Morganlake	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
123D: Klacking	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
124: Evart	Very poor.	Poor	Poor	Poor	Poor	Fair	Good	Poor	Poor	Fair.
127: Cathro	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
128: Dawson	Very poor.	Poor	Poor	Poor	Poor	Poor	Good	Poor	Poor	Fair.
130: Grousehaven	Very poor.	Poor	Poor	Poor	Poor	Fair	Good	Poor	Very poor.	Fair.
159A: Finch	Poor	Poor	Fair	Fair	Fair	Poor	Poor	Poor	Fair	Poor.

Table 12.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
182. Pits										
197A: Gladwin	Fair	Fair	Good	Good	Good	Fair	Poor	Fair	Good	Poor.
209B: Grayling	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
209C, 209D: Grayling	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
210B: Grayling	Poor	Poor	Fair	Poor	Poor	Poor	Very poor.	Poor	Poor	Very poor.
210C, 210D: Grayling	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
210E: Grayling	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
211B: Grayling	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
212B: Grayling	Poor	Poor	Fair	Poor	Poor	Poor	Very poor.	Poor	Poor	Very poor.
213B: Graycalm	Poor	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
214B, 215B, 216B, 220B: Typic Udipsamments	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
220D, 220E: Typic Udipsamments	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
221B: Typic Udipsamments	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
221C, 221D, 221E: Typic Udipsamments	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
222B: Typic Udipsamments	Poor	Poor	Fair	Fair	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
223B:										
Graycalm	Poor	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Grayling	Poor	Poor	Fair	Poor	Poor	Poor	Very poor.	Poor	Poor	Very poor.
223C, 223D:										
Graycalm	Poor	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Grayling	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.

Table 12.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
223E:										
Graycalm----------	Very poor.	Poor	Fair	Good	Good	Very poor.	Very poor.	Very poor.	Good	Very poor.
Grayling----------	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
224B--------------- Croswell	Poor	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
225B--------------- Entic Haplorthods	Poor	Poor	Fair	Fair	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
225C--------------- Entic Haplorthods	Very poor.	Poor	Fair	Fair	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
231D:										
Entic Haplorthods	Very poor.	Poor	Fair	Fair	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
Alfic Haplorthods	Poor	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
231E:										
Entic Haplorthods	Very poor.	Poor	Fair	Fair	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
Alfic Haplorthods	Very poor.	Very poor.	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
232B:										
Entic Haplorthods	Poor	Poor	Fair	Fair	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
Alfic Haplorthods	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
233B:										
Alfic Haplorthods	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Entic Haplorthods	Poor	Poor	Fair	Fair	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
233C, 233D:										
Alfic Haplorthods	Poor	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Entic Haplorthods	Very poor.	Poor	Fair	Fair	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
235B:										
Alfic Haplorthods, sandy over loamy	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Alfic Haplorthods, sandy------------	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

Table 12.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
235C:										
Alfic Haplorthods, sandy over loamy	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Alfic Haplorthods, sandy	Poor	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
236B Arenic Eutroboralfs	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
237B, 237D. Eutroboralfs										
254A:										
Borosaprists.										
Fluvaquents.										
Aquic Udipsamments	Poor	Poor	Fair	Good	Good	Fair	Poor	Poor	Good	Fair.
262A Au Gres	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
263A. Argic Endoaquods										
264A Allendale	Fair	Fair	Good	Good	Good	Poor	Fair	Fair	Good	Poor.
265B:										
Eutroboralfs.										
Allendale	Fair	Fair	Good	Good	Good	Poor	Fair	Fair	Good	Poor.
266A Typic Duraquods	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
272:										
Endoaquods.										
Fluvaquents.										
273:										
Leafriver	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Wakeley	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
274 Typic Endoaquods	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
280:										
Aquents.										
Histosols.										

Table 12.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
281----------------Borosaprists	Very poor.	Very poor.	Poor	Poor	Poor	Fair	Fair	Very poor.	Poor	Fair.
282----------------Borosaprists	Poor	Poor	Poor	Poor	Fair	Good	Good	Very poor.	Fair	Good.
343----------------Sims	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
355E:										
Crowell-----------	Poor	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Proper------------	Poor	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
356E:										
Aquepts.										
Histosols.										
Fluvaquents-------	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
357B:										
Udipsamments.										
Urban land.										
360----------------Wakeley	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
367A:										
Whittemore--------	Poor	Fair	Fair	Fair	Fair	Fair	Poor	Fair	Fair	Poor.
Springport--------	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
368A:										
Au Gres-----------	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
Deford------------	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
369----------------Deford	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
370A---------------McIvor	Poor	Poor	Fair	Fair	Fair	Poor	Poor	Poor	Fair	Poor.
371----------------Springport	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
372B:										
Proper------------	Poor	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
Leafriver---------	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
375----------------Kanotin	Very poor.	Poor	Fair	Fair	Fair	Fair	Good	Poor	Fair	Good.

Table 12.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
377----------------- Wabun	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
378A--------------- Algonquin	Fair	Good	Good	Good	Good	Good	Fair	Good	Good	Fair.
379A:										
Algonquin----------	Fair	Good	Good	Good	Good	Good	Fair	Good	Good	Fair.
Springport---------	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
380. Access denied										
381A:										
McIvor-------------	Poor	Poor	Fair	Fair	Fair	Poor	Poor	Poor	Fair	Poor.
Wakeley------------	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
382B--------------- Proper	Poor	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
383B--------------- Wurtsmith	Poor	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
392----------------- Caffey	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
403B--------------- Iargo	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
403C--------------- Iargo	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
404A--------------- Manary	Fair	Good	Good	Good	Good	Good	Fair	Good	Good	Fair.
405B:										
Manary-------------	Fair	Good	Good	Good	Good	Good	Fair	Good	Good	Fair.
Iargo--------------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
406A--------------- Winterfield	Poor	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
407----------------- Lacota	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
408----------------- Sims	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
409A:										
Finch--------------	Poor	Poor	Fair	Fair	Fair	Poor	Poor	Poor	Fair	Poor.
Deford-------------	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Au Gres------------	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.

Table 12.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
410B:										
Proper------------	Poor	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
Finch-------------	Poor	Poor	Fair	Fair	Fair	Poor	Poor	Poor	Fair	Poor.
Deford------------	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
411A--------------- Meehan	Poor	Fair	Good	Fair	Fair	Fair	Fair	Fair	Fair	Fair.
425D--------------- Hottis	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
426B, 426C--------- Coppler	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
427---------------- Tonkey	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
429D--------------- Menominee	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
430D--------------- Mongo	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
430E--------------- Mongo	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
431B--------------- Skeel	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
432B:										
Wurtsmith---------	Poor	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
Meehan------------	Poor	Fair	Good	Fair	Fair	Fair	Fair	Fair	Fair	Fair.
433B:										
Morganlake--------	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Graycalm----------	Poor	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
434D:										
Graycalm----------	Poor	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Menominee---------	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Morganlake--------	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
435B:										
Skeel-------------	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Algonquin---------	Fair	Good	Good	Good	Good	Good	Fair	Good	Good	Fair.

Table 12.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hardwood trees	Conif-erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
435B:										
Aquepts	Poor	Poor	Poor	Fair	Fair	Good	Good	Poor	Fair	Good.
436A:										
Manary	Fair	Good	Good	Good	Good	Good	Fair	Good	Good	Fair.
Whittemore	Poor	Fair	Fair	Fair	Fair	Fair	Poor	Fair	Fair	Poor.
Springport	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
437D:										
Wurtsmith	Poor	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
Meehan	Poor	Fair	Good	Fair	Fair	Fair	Fair	Fair	Fair	Fair.
Deer Park	Very poor.	Poor	Poor	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
438C:										
Meehan	Poor	Fair	Good	Fair	Fair	Fair	Fair	Fair	Fair	Fair.
Tawas	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Wurtsmith	Poor	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
439D Deer Park	Very poor.	Poor	Poor	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
440B:										
Kawkawlin	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Sims	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
441B, 441C:										
Morganlake	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Nester	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
442D:										
Menominee	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Curtisville	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
442E:										
Menominee	Poor	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Curtisville	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
443B:										
Kawkawlin	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Allendale	Fair	Fair	Good	Good	Good	Poor	Fair	Fair	Good	Poor.

Table 12.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
443B:										
Aquepts-----------	Poor	Poor	Poor	Fair	Fair	Good	Good	Poor	Fair	Good.
444B--------------- Kawkawlin	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
445A--------------- Corsair	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Poor.
446B:										
Wurtsmith---------	Poor	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
Meehan------------	Poor	Fair	Good	Fair	Fair	Fair	Fair	Fair	Fair	Fair.
Urban land.										
447A--------------- Whittemore	Poor	Fair	Fair	Fair	Fair	Fair	Poor	Fair	Fair	Poor.
448A:										
Meehan------------	Poor	Fair	Good	Fair	Fair	Fair	Fair	Fair	Fair	Fair.
Tawas-------------	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
449A--------------- Kokosing	Fair	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair.

Table 13.--Building Site Development

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
12B:						
Tawas	Severe: cutbanks cave, excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
Au Gres	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: too acid, wetness.
13:						
Tawas	Severe: cutbanks cave, excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
Lupton	Severe: excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
15A:						
Croswell	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: too acid.
Au Gres	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: too acid, wetness.
16B Graycalm	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: too acid, droughty.
16D Graycalm	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: too acid, droughty, slope.
17B Croswell	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: too acid.
18A Au Gres	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: too acid, wetness.
19 Leafriver	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding, excess humus.
25B Kent	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: droughty.

Table 13.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
25C----------------- Kent	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: droughty, slope.
26B----------------- Cublake	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: too acid, droughty.
27A----------------- Tacoda	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
28B----------------- East Lake	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: large stones, droughty.
39B----------------- Glennie	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Moderate: frost action.	Moderate: large stones, droughty.
39C----------------- Glennie	Severe: cutbanks cave.	Moderate: slope.	Moderate: wetness, slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, droughty, slope.
40A----------------- Sprinkler	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
47D----------------- Graycalm	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: too acid, droughty.
47F----------------- Graycalm	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: too acid, droughty, slope.
53B----------------- Negwegon	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength.	Moderate: wetness.
53C----------------- Negwegon	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, slope.
54A----------------- Algonquin	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
55------------------ Springport	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
56C----------------- Nester	Moderate: too clayey, wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.

Table 13.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
57B Kawkawlin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness, frost action.	Severe: wetness.
58A:						
Wakeley	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding.	Severe: ponding.	Severe: ponding, excess humus.
Allendale	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness.	Severe: wetness.
59B:						
Algonquin	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
Springport	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
62A Allendale	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness.	Severe: wetness.
70 Lupton	Severe: excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
71 Tawas	Severe: cutbanks cave, excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
72 Dorval	Severe: excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, shrink-swell.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
75B Rubicon	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
75D Rubicon	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
75E, 75F Rubicon	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
77 Rollaway	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding, flooding, frost action.	Severe: ponding, flooding, excess humus.
78. Pits						

Table 13.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
81B--------------- Grayling	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Severe: too acid, droughty.
81D--------------- Grayling	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: too acid, droughty.
81E--------------- Grayling	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: too acid, droughty, slope.
82C, 82F---------- Udorthents	Variable-------	Variable-------	Variable-------	Variable-------	Variable-------	Variable.
83B--------------- Udipsamments	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
84B--------------- Zimmerman	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
86:						
Histosols---------	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding, frost action.	Severe: ponding, excess humus.
Aquents----------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
93B:						
Tacoda-----------	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Wakeley----------	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding.	Severe: ponding.	Severe: ponding, excess humus.
97---------------- Colonville	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding, frost action.	Severe: wetness.
100D, 100E-------- Curtisville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
103B-------------- Nester	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
103C-------------- Nester	Moderate: too clayey, wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
108B-------------- Selkirk	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.

Table 13.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
114A: Ingalls	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
120B: Morganlake	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: too acid.
120C: Morganlake	Severe: cutbanks cave, wetness.	Moderate: wetness, slope.	Severe: wetness.	Severe: slope.	Moderate: wetness, slope.	Severe: too acid.
123D: Klacking	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope, too sandy.
124: Evart	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness, flooding.
127: Cathro	Severe: excess humus, ponding.	Severe: subsides, ponding.	Severe: subsides, ponding.	Severe: subsides, ponding.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
128: Dawson	Severe: cutbanks cave, excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
130: Grousehaven	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: low strength, ponding, frost action.	Severe: ponding, excess humus.
159A: Finch	Severe: cemented pan, cutbanks cave, wetness.	Severe: wetness.	Severe: wetness, cemented pan.	Severe: wetness.	Severe: wetness.	Severe: too acid, wetness, droughty.
182. Pits						
197A: Gladwin	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
209B: Grayling	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
209C: Grayling	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
209D: Grayling	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
210B: Grayling	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: too acid, droughty.

Table 13.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
210C-------------- Grayling	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: too acid, droughty.
210D, 210E-------- Grayling	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: too acid, droughty, slope.
211B-------------- Grayling	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Severe: droughty.
212B-------------- Grayling	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty, too sandy.
213B-------------- Graycalm	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Severe: too acid, droughty.
214B-------------- Typic Udipsamments	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Slight---------	Severe: droughty.
215B, 216B, 220B-- Typic Udipsamments	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty, too sandy.
220D, 220E-------- Typic Udipsamments	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
221B-------------- Typic Udipsamments	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty, too sandy.
221C-------------- Typic Udipsamments	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope, too sandy.
221D, 221E-------- Typic Udipsamments	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
222B-------------- Typic Udipsamments	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Slight---------	Moderate: droughty, too sandy.
223B:						
Graycalm---------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Severe: too acid, droughty.
Grayling---------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Severe: too acid, droughty.
223C:						
Graycalm---------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: too acid, droughty.

Table 13.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
223C:						
Grayling----------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: too acid, droughty.
223D, 223E:						
Graycalm----------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: too acid, droughty, slope.
Grayling----------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: too acid, droughty, slope.
224B-------------- Croswell	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: too acid.
225B-------------- Entic Haplorthods	Severe: cutbanks cave.	Slight----------	Slight----------	Slight----------	Slight----------	Moderate: droughty, too sandy.
225C-------------- Entic Haplorthods	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope, too sandy.
231D, 231E:						
Entic Haplorthods	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Alfic Haplorthods	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
232B:						
Entic Haplorthods	Severe: cutbanks cave.	Slight----------	Moderate: wetness.	Slight----------	Slight----------	Moderate: droughty, too sandy.
Alfic Haplorthods	Severe: cutbanks cave.	Slight----------	Slight----------	Slight----------	Slight----------	Moderate: droughty, too sandy.
233B:						
Alfic Haplorthods	Severe: cutbanks cave.	Slight----------	Slight----------	Slight----------	Slight----------	Moderate: droughty, too sandy.
Entic Haplorthods	Severe: cutbanks cave.	Slight----------	Slight----------	Slight----------	Slight----------	Moderate: droughty, too sandy.
233C:						
Alfic Haplorthods	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope, too sandy.

Table 13.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
233C:						
Entic Haplorthods	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope, too sandy.
233D:						
Alfic Haplorthods	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Entic Haplorthods	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
235B:						
Alfic Haplorthods, sandy over loamy	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
Alfic Haplorthods, sandy	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
235C:						
Alfic Haplorthods, sandy over loamy	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope, too sandy.
Alfic Haplorthods, sandy	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope, too sandy.
236B: Arenic Eutroboralfs	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: droughty.
237B: Eutroboralfs	Slight	Slight	Slight	Slight	Slight	Slight.
237D: Eutroboralfs	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
254A:						
Borosaprists.						
Fluvaquents	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding, flooding.	Severe: ponding, flooding.

Table 13.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
254A:						
Aquic Udipsamments	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness.
262A, Au Gres	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: too acid, wetness.
263A, Argic Endoaquods	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
264A, Allendale	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness.	Severe: wetness.
265B:						
Eutroboralfs	Slight	Slight	Slight	Moderate:	Slight	Slight.
Allendale	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness.	Severe: wetness.
266A, Typic Duraquods	Severe: cemented pan, cutbanks cave.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan, frost action.	Severe: cemented pan, droughty.
272:						
Endoaquods	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Fluvaquents	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding.
273:						
Leafriver	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, ponding.	Severe: excess humus, ponding.
Wakeley	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding.	Severe: ponding.	Severe: ponding.
274, Typic Endoaquods	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, ponding.	Severe: ponding.
280:						
Aquents	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, ponding.	Severe: ponding.
Histosols	Severe: excess humus, ponding.	Severe: low strength, ponding.	Severe: ponding.	Severe: low strength, ponding.	Severe: frost action, ponding.	Severe: excess humus, ponding.
281, 282, Borosaprists	Severe: excess humus, ponding.	Severe: low strength, ponding.	Severe: ponding.	Severe: low strength, ponding.	Severe: frost action, ponding.	Severe: excess humus, ponding.

Table 13.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
343---------------Sims	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, low strength, ponding.	Severe: ponding.
355E:						
Crowell-----------	Severe: cemented pan, cutbanks cave, slope.	Severe: slope.	Severe: cemented pan, slope.	Severe: slope.	Severe: slope.	Severe: cemented pan, slope, too acid.
Proper------------	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Moderate: wetness.	Severe: droughty.
356E:						
Aquepts-----------	Severe: slope, wetness.	Severe: slope, wetness.	Severe: slope, wetness.	Severe: slope, wetness.	Severe: slope, wetness.	Severe: slope, wetness.
Histosols---------	Severe: excess humus, ponding.	Severe: low strength, ponding.	Severe: ponding.	Severe: low strength, ponding.	Severe: frost action, ponding.	Severe: excess humus, ponding.
Fluvaquents-------	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action, wetness.	Severe: flooding, wetness.
357B:						
Udipsamments------	Severe: cutbanks cave.	Slight-----------	Slight-----------	Moderate: slope.	Slight-----------	Moderate: droughty.
Urban land--------	Variable--------	Variable--------	Variable--------	Variable--------	Variable--------	Variable.
360---------------Wakeley	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding.	Severe: ponding.	Severe: excess humus, ponding.
367A:						
Whittemore--------	Severe: cemented pan, cutbanks cave, wetness.	Severe: wetness.	Severe: cemented pan, wetness.	Severe: wetness.	Moderate: cemented pan, frost action, wetness.	Severe: cemented pan, droughty.
Springport--------	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, shrink-swell.	Severe: ponding.
368A:						
Au Gres-----------	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Deford------------	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: excess humus, ponding.
369---------------Deford	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: excess humus, ponding.

Table 13.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
370A-------------- McIvor	Severe: cemented pan, cutbanks cave, wetness.	Severe: wetness.	Severe: cemented pan, wetness.	Severe: wetness.	Severe: wetness.	Severe: cemented pan, droughty, wetness.
371--------------- Springport	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, shrink-swell.	Severe: ponding.
372B:						
Proper-----------	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: droughty.
Leafriver--------	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, ponding.	Severe: excess humus, ponding.
375--------------- Kanotin	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: excess humus, ponding.
377--------------- Wabun	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
378A-------------- Algonquin	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: low strength, shrink-swell, wetness.	Severe: too clayey, wetness.
379A:						
Algonquin--------	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: low strength, shrink-swell, wetness.	Severe: too clayey, wetness.
Springport-------	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, shrink-swell.	Severe: ponding.
380. Access denied						
381A:						
McIvor-----------	Severe: cemented pan, cutbanks cave, wetness.	Severe: wetness.	Severe: cemented pan, wetness.	Severe: wetness.	Severe: wetness.	Severe: cemented pan, droughty, wetness.
Wakeley----------	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding.	Severe: ponding.	Severe: excess humus, ponding.
382B-------------- Proper	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: droughty.
383B-------------- Wurtsmith	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: droughty, too sandy.

Table 13.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
392-----Caffey	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
403B-----Iargo	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell, wetness.	Moderate: shrink-swell, slope.	Severe: frost action, low strength.	Slight.
403C-----Iargo	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, slope, wetness.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope.
404A-----Manary	Severe: cutbanks cave, wetness.	Severe: shrink-swell, wetness.	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: low strength, shrink-swell, wetness.	Severe: wetness.
405B:						
Manary-----	Severe: cutbanks cave, wetness.	Severe: shrink-swell, wetness.	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: low strength, shrink-swell, wetness.	Severe: wetness.
Iargo-----	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell, wetness.	Moderate: shrink-swell.	Severe: frost action, low strength.	Slight.
406A-----Winterfield	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.
407-----Lacota	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, low strength, ponding.	Severe: ponding.
408-----Sims	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, low strength, ponding.	Severe: ponding.
409A:						
Finch-----	Severe: cemented pan, cutbanks cave, wetness.	Severe: wetness.	Severe: cemented pan, wetness.	Severe: wetness.	Severe: wetness.	Severe: cemented pan, droughty, wetness.
Deford-----	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: excess humus, ponding.
Au Gres-----	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
410B:						
Proper-----	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: droughty.

Table 13.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
410B:						
Finch	Severe: cemented pan, cutbanks cave, wetness.	Severe: wetness.	Severe: cemented pan, wetness.	Severe: wetness.	Severe: wetness.	Severe: cemented pan, droughty, wetness.
Deford	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: excess humus, ponding.
411A Meehan	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: frost action, wetness.	Severe: droughty, too sandy, wetness.
425D Hottis	Severe: slope.	Severe: shrink-swell, slope.	Severe: shrink-swell, slope.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell, slope.	Severe: slope.
426B Coppler	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, large stones.
426C Coppler	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, large stones, slope.
427 Tonkey	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, ponding.	Severe: ponding.
429D Menominee	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
430D, 430E Mongo	Severe: slope.	Severe: shrink-swell, slope.	Severe: shrink-swell, slope.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell, slope.	Severe: slope.
431B Skeel	Severe: cemented pan, cutbanks cave, wetness.	Moderate: cemented pan, wetness.	Severe: cemented pan, wetness.	Moderate: cemented pan, wetness.	Moderate: cemented pan, wetness.	Severe: cemented pan.
432B:						
Wurtsmith	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: droughty, too sandy.
Meehan	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: frost action, wetness.	Severe: droughty, too sandy, wetness.
433B:						
Morganlake	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: too acid.

Table 13.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
433B:						
Graycalm	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
434D:						
Graycalm	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
Menominee	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Morganlake	Severe: cutbanks cave, wetness.	Moderate: slope, wetness.	Severe: wetness.	Severe: slope.	Moderate: slope, wetness.	Severe: too acid.
435B:						
Skeel	Severe: cemented pan, cutbanks cave, wetness.	Moderate: cemented pan, wetness.	Severe: cemented pan, wetness.	Moderate: cemented pan, wetness.	Moderate: cemented pan, wetness.	Severe: cemented pan.
Algonquin	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: low strength, shrink-swell, wetness.	Severe: too clayey, wetness.
Aquepts	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
436A:						
Manary	Severe: cutbanks cave, wetness.	Severe: shrink-swell, wetness.	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: low strength, shrink-swell, wetness.	Severe: wetness.
Whittemore	Severe: cemented pan, cutbanks cave, wetness.	Severe: wetness.	Severe: cemented pan, wetness.	Severe: wetness.	Moderate: cemented pan, frost action, wetness.	Severe: cemented pan, droughty.
Springport	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, shrink-swell.	Severe: ponding.
437D:						
Wurtsmith	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Moderate: wetness.	Moderate: droughty, too sandy.
Meehan	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: frost action, wetness.	Severe: droughty, too sandy, wetness.
Deer Park	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.

Table 13.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
438C:						
Meehan	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: frost action, wetness.	Severe: droughty, too sandy, wetness.
Tawas	Severe: cutbanks cave, excess humus, ponding.	Severe: low strength, ponding, subsides.	Severe: ponding, subsides.	Severe: low strength, ponding, subsides.	Severe: frost action, ponding, subsides.	Severe: excess humus, ponding.
Wurtsmith	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Moderate: wetness.	Moderate: droughty, too sandy.
439D Deer Park	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
440B:						
Kawkawlin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength.	Moderate: wetness.
Sims	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, low strength, ponding.	Severe: ponding.
441B:						
Morganlake	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: too acid.
Nester	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: shrink-swell, wetness.	Moderate: shrink-swell.	Severe: low strength.	Moderate: droughty.
441C:						
Morganlake	Severe: cutbanks cave, wetness.	Moderate: slope, wetness.	Severe: wetness.	Severe: slope.	Moderate: slope, wetness.	Severe: too acid.
Nester	Moderate: slope, too clayey, wetness.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, slope, wetness.	Severe: slope.	Severe: low strength.	Moderate: droughty, slope.
442D, 442E:						
Menominee	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Curtisville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
443B:						
Kawkawlin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength.	Moderate: wetness.

Table 13.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
443B:						
Allendale	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Aquepts	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
444B Kawkawlin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness, frost action.	Severe: wetness.
445A Corsair	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: wetness, droughty.
446B:						
Wurtsmith	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: droughty, too sandy.
Meehan	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Severe: too acid.
Urban land	Variable	Variable	Variable	Variable	Variable	Variable.
447A Whittemore	Severe: cemented pan, cutbanks cave, wetness.	Severe: wetness.	Severe: wetness, cemented pan.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty, cemented pan.
448A:						
Meehan	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Severe: too acid.
Tawas	Severe: cutbanks cave, excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
449A Kokosing	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.

Table 14.--Sanitary Facilities

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Area sanitary landfill	Daily cover for landfill
12B:				
Tawas	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
Au Gres	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
13:				
Tawas	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
Lupton	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding.	Poor: ponding, excess humus.
15A:				
Croswell	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, too acid.
Au Gres	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
16B Graycalm	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.
16D Graycalm	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
17B Croswell	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, too acid.
18A Au Gres	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.

Table 14.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Area sanitary landfill	Daily cover for landfill
19. Leafriver	Severe: ponding, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
25B. Kent	Severe: percs slowly.	Moderate: slope.	Slight	Poor: too clayey, hard to pack.
25C. Kent	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Poor: too clayey, hard to pack.
26B. Cublake	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: seepage.	Poor: seepage, too sandy, too acid.
27A. Tacoda	Severe: wetness, percs slowly, poor filter.	Severe: seepage.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
28B. East Lake	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy, small stones.
39B. Glennie	Severe: wetness, percs slowly.	Severe: seepage.	Moderate: wetness.	Poor: thin layer.
39C. Glennie	Severe: wetness, percs slowly.	Severe: seepage, slope.	Moderate: wetness, slope.	Poor: thin layer.
40A. Sprinkler	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Poor: wetness.
47D. Graycalm	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Poor: seepage, too sandy.
47F. Graycalm	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
53B. Negwegon	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
53C. Negwegon	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
54A. Algonquin	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Poor: too clayey, hard to pack, wetness.

Table 14.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Area sanitary landfill	Daily cover for landfill
55----------------- Springport	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
56C---------------- Nester	Severe: wetness, percs slowly.	Severe: slope.	Moderate: wetness, slope.	Fair: too clayey, small stones, slope.
57B---------------- Kawkawlin	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Poor: wetness.
58A:				
Wakeley------------	Severe: ponding, percs slowly, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding.	Poor: too clayey, hard to pack, ponding.
Allendale----------	Severe: wetness, percs slowly, poor filter.	Severe: seepage.	Severe: seepage, wetness.	Poor: too clayey, hard to pack, wetness.
59B:				
Algonquin----------	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Springport---------	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
62A---------------- Allendale	Severe: wetness, percs slowly, poor filter.	Severe: seepage.	Severe: seepage, wetness.	Poor: too clayey, hard to pack, wetness.
70----------------- Lupton	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding.	Poor: ponding, excess humus.
71----------------- Tawas	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
72----------------- Dorval	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding.	Poor: too clayey, hard to pack, ponding.
75B---------------- Rubicon	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.
75D---------------- Rubicon	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Poor: seepage, too sandy.

Table 14.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Area sanitary landfill	Daily cover for landfill
75E, 75F Rubicon	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
77 Rollaway	Severe: flooding, ponding, percs slowly.	Severe: flooding, excess humus, ponding.	Severe: flooding, ponding.	Poor: ponding.
78. Pits				
81B Grayling	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.
81D Grayling	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Poor: seepage, too sandy.
81E Grayling	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
82C, 82F Udorthents	Variable	Variable	Variable	Variable.
83B Udipsamments	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Poor: seepage.
84B Zimmerman	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.
86:				
Histosols	Severe: ponding.	Severe: excess humus, ponding.	Severe: ponding.	Poor: ponding, excess humus.
Aquents	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
93B:				
Tacoda	Severe: wetness, percs slowly, poor filter.	Severe: seepage.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Wakeley	Severe: ponding, percs slowly, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding.	Poor: too clayey, hard to pack, ponding.
97 Colonville	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Poor: too sandy, wetness.
100D, 100E Curtisville	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Poor: slope.

Table 14.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Area sanitary landfill	Daily cover for landfill
103B---------------- Nester	Severe: wetness, percs slowly.	Moderate: seepage, slope.	Moderate: wetness.	Fair: too clayey, small stones.
103C---------------- Nester	Severe: wetness, percs slowly.	Severe: slope.	Moderate: wetness, slope.	Fair: too clayey, small stones, slope.
108B---------------- Selkirk	Severe: wetness, percs slowly.	Moderate: seepage, slope.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
114A---------------- Ingalls	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: wetness.
120B---------------- Morganlake	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: seepage.	Fair: too clayey, wetness.
120C---------------- Morganlake	Severe: wetness, percs slowly, poor filter.	Severe: seepage, slope, wetness.	Severe: seepage.	Fair: too clayey, slope, wetness.
123D---------------- Klacking	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Poor: seepage, too sandy.
124----------------- Evart	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
127----------------- Cathro	Severe: ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding.	Poor: ponding.
128----------------- Dawson	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding.	Poor: ponding, excess humus.
130----------------- Grousehaven	Severe: ponding, percs slowly.	Severe: excess humus, ponding.	Severe: ponding.	Poor: hard to pack, ponding.
159A---------------- Finch	Severe: cemented pan, wetness, poor filter.	Severe: seepage, cemented pan, wetness.	Severe: cemented pan, seepage, wetness.	Poor: cemented pan, seepage, too sandy.
182. Pits				

Table 14.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Area sanitary landfill	Daily cover for landfill
197A---------------- Gladwin	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
209B---------------- Grayling	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.
209C---------------- Grayling	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Poor: seepage, too sandy.
209D---------------- Grayling	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
210B---------------- Grayling	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.
210C---------------- Grayling	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Poor: seepage, too sandy.
210D, 210E---------- Grayling	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
211B, 212B---------- Grayling	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.
213B---------------- Graycalm	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.
214B---------------- Typic Udipsamments	Severe: wetness, poor filter.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.
215B, 216B, 220B---- Typic Udipsamments	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.
220D, 220E---------- Typic Udipsamments	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
221B---------------- Typic Udipsamments	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.
221C---------------- Typic Udipsamments	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Poor: seepage, too sandy.

Table 14.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Area sanitary landfill	Daily cover for landfill
221D, 221E---------- Typic Udipsamments	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
222B---------------- Typic Udipsamments	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.
223B:				
Graycalm-----------	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.
Grayling-----------	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.
223C:				
Graycalm-----------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Poor: seepage, too sandy.
Grayling-----------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Poor: seepage, too sandy.
223D, 223E:				
Graycalm-----------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
Grayling-----------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
224B---------------- Croswell	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, too acid.
225B---------------- Entic Haplorthods	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.
225C---------------- Entic Haplorthods	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Poor: seepage, too sandy.
231D, 231E:				
Entic Haplorthods--	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
Alfic Haplorthods--	Severe: percs slowly, poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.

Table 14.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Area sanitary landfill	Daily cover for landfill
232B:				
Entic Haplorthods	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.
Alfic Haplorthods	Severe: percs slowly, poor filter.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.
233B:				
Alfic Haplorthods	Severe: percs slowly, poor filter.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.
Entic Haplorthods	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.
233C:				
Alfic Haplorthods	Severe: percs slowly, poor filter.	Severe: seepage, slope.	Severe: seepage.	Poor: seepage, too sandy.
Entic Haplorthods	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Poor: seepage, too sandy.
233D:				
Alfic Haplorthods	Severe: percs slowly, poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
Entic Haplorthods	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
235B:				
Alfic Haplorthods, sandy over loamy	Severe: percs slowly, poor filter.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.
Alfic Haplorthods, sandy	Severe: percs slowly, poor filter.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.
235C:				
Alfic Haplorthods, sandy over loamy	Severe: percs slowly, poor filter.	Severe: seepage, slope.	Severe: seepage.	Poor: seepage, too sandy.
Alfic Haplorthods, sandy	Severe: percs slowly, poor filter.	Severe: seepage, slope.	Severe: seepage.	Poor: seepage, too sandy.

Table 14.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Area sanitary landfill	Daily cover for landfill
236B: Arenic Eutroboralfs	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.
237B: Eutroboralfs	Slight	Moderate: slope.	Slight	Good.
237D: Eutroboralfs	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
254A: Borosaprists.				
Fluvaquents	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: ponding.
Aquic Udipsamments	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
262A: Au Gres	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
263A: Argic Endoaquods	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
264A: Allendale	Severe: wetness, percs slowly, poor filter.	Severe: seepage.	Severe: seepage, wetness.	Poor: too clayey, hard to pack, wetness.
265B:				
Eutroboralfs	Slight	Moderate: slope.	Slight	Good.
Allendale	Severe: wetness, percs slowly, poor filter.	Severe: seepage.	Severe: seepage, wetness.	Poor: too clayey, hard to pack, wetness.
266A: Typic Duraquods	Severe: cemented pan, wetness, poor filter.	Severe: seepage, cemented pan, wetness.	Severe: cemented pan, seepage.	Poor: cemented pan, seepage, too sandy.
272: Endoaquods.				
Fluvaquents	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: ponding.
273:				
Leafriver	Severe: ponding, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.

Table 14.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Area sanitary landfill	Daily cover for landfill
273:				
Wakeley	Severe: ponding, percs slowly, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding.	Poor: too clayey, hard to pack, ponding.
274 Typic Endoaquods	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
280:				
Aquents	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Histosols	Severe: ponding.	Severe: excess humus, ponding.	Severe: ponding.	Poor: ponding, excess humus.
281, 282 Borosaprists	Severe: ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding.	Poor: ponding, excess humus.
343 Sims	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Poor: ponding.
355E:				
Crowell	Severe: cemented pan, poor filter, slope.	Severe: seepage, cemented pan, slope.	Severe: cemented pan, seepage, slope.	Poor: cemented pan, seepage, too sandy.
Proper	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy.
356E:				
Aquepts	Severe: wetness, slope.	Severe: slope, wetness.	Severe: wetness, slope.	Poor: slope, wetness.
Histosols	Severe: ponding.	Severe: excess humus, ponding.	Severe: ponding.	Poor: ponding, excess humus.
Fluvaquents	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
357B:				
Udipsamments	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.
Urban land	Variable	Variable	Variable	Variable.
360 Wakeley	Severe: ponding, percs slowly, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding.	Poor: too clayey, hard to pack, ponding.

Table 14.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Area sanitary landfill	Daily cover for landfill
367A:				
Whittemore	Severe: cemented pan, wetness, percs slowly.	Severe: seepage, cemented pan.	Severe: cemented pan, seepage, wetness.	Poor: cemented pan, seepage, too sandy.
Springport	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
368A:				
Au Gres	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Deford	Severe: ponding, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
369 Deford	Severe: ponding, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
370A McIvor	Severe: cemented pan, wetness, percs slowly.	Severe: seepage, cemented pan.	Severe: cemented pan, seepage, wetness.	Poor: cemented pan, seepage, too sandy.
371 Springport	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
372B:				
Proper	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Leafriver	Severe: ponding, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
375 Kanotin	Severe: ponding, percs slowly.	Severe: excess humus, ponding.	Severe: ponding.	Poor: too sandy, ponding.
377 Wabun	Severe: ponding, percs slowly, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
378A Algonquin	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Poor: too clayey, hard to pack, wetness.

Table 14.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Area sanitary landfill	Daily cover for landfill
379A:				
Algonquin	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Springport	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
380. Access denied				
381A:				
McIvor	Severe: cemented pan, wetness, percs slowly.	Severe: seepage, cemented pan.	Severe: cemented pan, seepage, wetness.	Poor: cemented pan, seepage, too sandy.
Wakeley	Severe: ponding, percs slowly, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding.	Poor: too clayey, hard to pack, ponding.
382B Proper	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy.
383B Wurtsmith	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy.
392 Caffey	Severe: ponding, percs slowly.	Severe: seepage, ponding.	Severe: seepage, ponding.	Poor: ponding.
403B Iargo	Severe: wetness, percs slowly.	Moderate: slope.	Moderate: wetness.	Fair: too clayey, too sandy.
403C Iargo	Severe: wetness, percs slowly.	Severe: slope.	Moderate: wetness, slope.	Fair: too clayey, too sandy, slope.
404A Manary	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Poor: too clayey, too sandy, wetness.
405B:				
Manary	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Poor: too clayey, too sandy, wetness.
Iargo	Severe: wetness, percs slowly.	Moderate: slope.	Moderate: wetness.	Fair: too clayey, too sandy.

Table 14.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Area sanitary landfill	Daily cover for landfill
406A: Winterfield	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
407: Lacota	Severe: ponding, percs slowly, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
408: Sims	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Poor: ponding.
409A:				
Finch	Severe: cemented pan, wetness, poor filter.	Severe: seepage, cemented pan, wetness.	Severe: cemented pan, seepage, wetness.	Poor: cemented pan, seepage, too sandy.
Deford	Severe: ponding, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
Au Gres	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
410B:				
Proper	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Finch	Severe: cemented pan, wetness, poor filter.	Severe: seepage, cemented pan, wetness.	Severe: cemented pan, seepage, wetness.	Poor: cemented pan, seepage, too sandy.
Deford	Severe: ponding, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
411A: Meehan	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
425D: Hottis	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Poor: too clayey, hard to pack, slope.
426B: Coppler	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy, small stones.

Table 14.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Area sanitary landfill	Daily cover for landfill
426C---------------- Coppler	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Poor: seepage, too sandy, small stones.
427----------------- Tonkey	Severe: ponding.	Severe: seepage, ponding.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
429D---------------- Menominee	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
430D, 430E---------- Mongo	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Poor: too clayey, hard to pack, slope.
431B---------------- Skeel	Severe: cemented pan, wetness, percs slowly.	Severe: seepage, cemented pan, wetness.	Severe: cemented pan, seepage.	Poor: cemented pan.
432B:				
Wurtsmith----------	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Meehan-------------	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
433B:				
Morganlake---------	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: seepage.	Fair: too clayey, wetness.
Graycalm-----------	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.
434D:				
Graycalm-----------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Poor: seepage, too sandy.
Menominee----------	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
Morganlake---------	Severe: wetness, percs slowly, poor filter.	Severe: seepage, slope, wetness.	Severe: seepage.	Fair: too clayey, slope, wetness.

Table 14.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Area sanitary landfill	Daily cover for landfill
435B:				
Skeel	Severe: cemented pan, wetness, percs slowly.	Severe: seepage, cemented pan, wetness.	Severe: cemented pan, seepage.	Poor: cemented pan.
Algonquin	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Aquepts	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
436A:				
Manary	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Poor: too clayey, too sandy, wetness.
Whittemore	Severe: cemented pan, wetness, percs slowly.	Severe: seepage, cemented pan.	Severe: cemented pan, seepage, wetness.	Poor: cemented pan, seepage, too sandy.
Springport	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
437D:				
Wurtsmith	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Meehan	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Deer Park	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Poor: seepage, too sandy.
438C:				
Meehan	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Tawas	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
Wurtsmith	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy.
439D Deer Park	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Poor: seepage, too sandy.

Table 14.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Area sanitary landfill	Daily cover for landfill
440B:				
Kawkawlin----------	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Poor: wetness.
Sims---------------	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Poor: ponding.
441B:				
Morganlake---------	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: seepage.	Fair: too clayey, wetness.
Nester-------------	Severe: wetness, percs slowly.	Moderate: seepage, slope.	Moderate: wetness.	Fair: too clayey, small stones.
441C:				
Morganlake---------	Severe: wetness, percs slowly, poor filter.	Severe: seepage, slope, wetness.	Severe: seepage.	Fair: too clayey, slope, wetness.
Nester-------------	Severe: wetness, percs slowly.	Severe: slope.	Moderate: wetness, slope.	Fair: too clayey, small stones, slope.
442D, 442E:				
Menominee----------	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
Curtisville--------	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Poor: slope.
443B:				
Kawkawlin----------	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Poor: wetness.
Allendale----------	Severe: wetness, percs slowly, poor filter.	Severe: seepage.	Severe: seepage, wetness.	Poor: too clayey, hard to pack, wetness.
Aquepts------------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
444B---------------- Kawkawlin	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Poor: wetness.
445A---------------- Corsair	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.

Table 14.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Area sanitary landfill	Daily cover for landfill
446B:				
Wurtsmith	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Meehan	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Urban land	Variable	Variable	Variable	Variable.
447A Whittemore	Severe: cemented pan, wetness, percs slowly.	Severe: seepage, cemented pan.	Severe: cemented pan, seepage, wetness.	Poor: cemented pan, seepage, too sandy.
448A:				
Meehan	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Tawas	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
449A Kokosing	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: wetness.

Table 15.--Construction Materials

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
12B:				
Tawas	Poor: wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.
Au Gres	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness, too acid.
13:				
Tawas	Poor: wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.
Lupton	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
15A:				
Croswell	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, too acid.
Au Gres	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness, too acid.
16B Graycalm	Good	Probable	Improbable: too sandy.	Poor: too sandy, small stones, too acid.
16D Graycalm	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, small stones, too acid.
17B Croswell	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, too acid.
18A Au Gres	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness, too acid.
19 Leafriver	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
25B, 25C Kent	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

Table 15.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
26B Cublake	Fair: wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, too acid.
27A Tacoda	Poor: wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness.
28B East Lake	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
39B, 39C Glennie	Fair: thin layer, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too sandy, small stones.
40A Sprinkler	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
47D Graycalm	Good	Probable	Improbable: too sandy.	Poor: too sandy, small stones, too acid.
47F Graycalm	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, small stones, too acid.
53B, 53C Negwegon	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
54A Algonquin	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
55 Springport	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
56C Nester	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
57B Kawkawlin	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
58A:				
Wakeley	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
Allendale	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.

Table 15.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
59B:				
Algonquin	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Springport	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
62A: Allendale	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
70: Lupton	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
71: Tawas	Poor: wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.
72: Dorval	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.
75B, 75D: Rubicon	Good	Probable	Improbable: too sandy.	Poor: too sandy.
75E, 75F: Rubicon	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
77: Rollaway	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
78. Pits				
81B, 81D: Grayling	Good	Probable	Improbable: too sandy.	Poor: too sandy, too acid.
81E: Grayling	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, too acid, slope.
82C, 82F: Udorthents	Variable	Variable	Variable	Variable.
83B: Udipsamments	Good	Probable	Improbable: too sandy.	Fair: too sandy, small stones.
84B: Zimmerman	Good	Probable	Improbable: too sandy.	Poor: too sandy.

Table 15.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
86:				
Histosols	Poor: wetness, low strength.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
Aquents	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
93B:				
Tacoda	Poor: wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness.
Wakeley	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
97 Colonville	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
100D Curtisville	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
100E Curtisville	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
103B, 103C Nester	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
108B Selkirk	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
114A Ingalls	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
120B, 120C Morganlake	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, too acid.
123D Klacking	Good	Probable	Improbable: too sandy.	Poor: too sandy, small stones.
124 Evart	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, small stones, wetness.
127 Cathro	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.

Table 15.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
128: Dawson	Poor: wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.
130: Grousehaven	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
159A: Finch	Poor: wetness.	Probable	Improbable: too sandy.	Poor: cemented pan, area reclaim, too sandy.
182. Pits				
197A: Gladwin	Poor: wetness.	Probable	Probable	Poor: small stones, area reclaim.
209B, 209C: Grayling	Good	Probable	Improbable: too sandy.	Poor: too sandy.
209D: Grayling	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
210B, 210C: Grayling	Good	Probable	Improbable: too sandy.	Poor: too sandy, too acid.
210D: Grayling	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, too acid, slope.
210E: Grayling	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, too acid, slope.
211B, 212B: Grayling	Good	Probable	Improbable: too sandy.	Poor: too sandy.
213B: Graycalm	Good	Probable	Improbable: too sandy.	Poor: too sandy, small stones, too acid.
214B, 215B, 216B, 220B: Typic Udipsamments	Good	Probable	Improbable: too sandy.	Poor: too sandy.
220D: Typic Udipsamments	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
220E: Typic Udipsamments	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.

Table 15.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
221B, 221C: Typic Udipsamments	Good	Probable	Improbable: too sandy.	Poor: too sandy.
221D: Typic Udipsamments	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
221E: Typic Udipsamments	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
222B: Typic Udipsamments	Good	Probable	Improbable: too sandy.	Poor: too sandy.
223B, 223C:				
Graycalm	Good	Probable	Improbable: too sandy.	Poor: too sandy, small stones, too acid.
Grayling	Good	Probable	Improbable: too sandy.	Poor: too sandy, too acid.
223D:				
Graycalm	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, small stones, too acid.
Grayling	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, too acid, slope.
223E:				
Graycalm	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, small stones, too acid.
Grayling	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, too acid, slope.
224B: Croswell	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, too acid.
225B, 225C: Entic Haplorthods	Good	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
231D:				
Entic Haplorthods	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
Alfic Haplorthods	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.

Table 15.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
231E:				
Entic Haplorthods	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
Alfic Haplorthods	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
232B:				
Entic Haplorthods	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Alfic Haplorthods	Good	Probable	Improbable: too sandy.	Poor: too sandy.
233B, 233C:				
Alfic Haplorthods	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Entic Haplorthods	Good	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
233D:				
Alfic Haplorthods	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
Entic Haplorthods	Fair: slope.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, slope.
235B, 235C:				
Alfic Haplorthods, sandy over loamy	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Alfic Haplorthods, sandy	Good	Probable	Improbable: too sandy.	Poor: too sandy.
236B Arenic Eutroboralfs	Good	Probable	Improbable: too sandy.	Poor: too sandy, small stones.
237B Eutroboralfs	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
237D Eutroboralfs	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
254A:				
Borosaprists.				
Fluvaquents	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Aquic Udipsamments	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.

Table 15.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
262A------------------ Au Gres	Poor: wetness.	Probable------------	Improbable: too sandy.	Poor: too sandy, wetness, too acid.
263A------------------ Argic Endoaquods	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
264A------------------ Allendale	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
265B:				
Eutroboralfs---------	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Good.
Allendale------------	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
266A------------------ Typic Duraquods	Fair: wetness.	Probable------------	Improbable: too sandy.	Poor: cemented pan, area reclaim, too sandy.
272: Endoaquods.				
Fluvaquents----------	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
273:				
Leafriver------------	Poor: wetness.	Probable------------	Improbable: too sandy.	Poor: too sandy, wetness.
Wakeley--------------	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
274------------------- Typic Endoaquods	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
280:				
Aquents--------------	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Histosols------------	Poor: wetness, low strength.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
281, 282-------------- Borosaprists	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
343------------------- Sims	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.

Table 15.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
355E:				
Crowell	Fair: slope.	Probable	Improbable: too sandy.	Poor: cemented pan, area reclaim, too sandy.
Proper	Fair: wetness.	Probable	Improbable: too sandy.	Poor: area reclaim, too sandy.
356E:				
Aquepts	Poor: wetness, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, slope.
Histosols	Poor: wetness, low strength.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
Fluvaquents	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
357B:				
Udipsamments	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Urban land	Variable	Variable	Variable	Variable.
360 Wakeley	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
367A:				
Whittemore	Poor: wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: cemented pan, area reclaim, too sandy.
Springport	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
368A:				
Au Gres	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness, too acid.
Deford	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
369 Deford	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
370A McIvor	Poor: wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: cemented pan, area reclaim, too sandy.

Table 15.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
371------------------- Springport	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
372B:				
Proper---------------	Fair: wetness.	Probable-------------	Improbable: too sandy.	Poor: area reclaim, too sandy.
Leafriver------------	Poor: wetness.	Probable-------------	Improbable: too sandy.	Poor: too sandy, wetness.
375------------------- Kanotin	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
377------------------- Wabun	Poor: wetness.	Probable-------------	Improbable: too sandy.	Poor: too sandy, wetness.
378A------------------ Algonquin	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
379A:				
Algonquin------------	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Springport-----------	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
380. Access denied				
381A:				
McIvor---------------	Poor: wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: cemented pan, area reclaim, too sandy.
Wakeley--------------	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
382B------------------ Proper	Fair: wetness.	Probable-------------	Improbable: too sandy.	Poor: area reclaim, too sandy.
383B------------------ Wurtsmith	Fair: wetness.	Probable-------------	Improbable: too sandy.	Poor: too sandy.
392------------------- Caffey	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.

Table 15.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
403B, 403C: Iargo	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
404A: Manary	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
405B:				
Manary	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
Iargo	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
406A: Winterfield	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
407: Lacota	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
408: Sims	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
409A:				
Finch	Poor: wetness.	Probable	Improbable: too sandy.	Poor: cemented pan, area reclaim, too sandy.
Deford	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
Au Gres	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness, too acid.
410B:				
Proper	Fair: wetness.	Probable	Improbable: too sandy.	Poor: area reclaim, too sandy.
Finch	Poor: wetness.	Probable	Improbable: too sandy.	Poor: cemented pan, area reclaim, too sandy.
Deford	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
411A: Meehan	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, too acid.
425D: Hottis	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.

Table 15.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
426B, 426C: Coppler	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
427: Tonkey	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
429D: Menominee	Fair: shrink-swell, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
430D: Mongo	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
430E: Mongo	Poor: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
431B: Skeel	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: cemented pan, area reclaim, too sandy.
432B:				
Wurtsmith	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
Meehan	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, too acid.
433B:				
Morganlake	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, too acid.
Graycalm	Good	Probable	Improbable: too sandy.	Poor: too sandy, small stones, too acid.
434D:				
Graycalm	Good	Probable	Improbable: too sandy.	Poor: too sandy, small stones, too acid.
Menominee	Fair: shrink-swell, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Morganlake	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, too acid.

Table 15.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
435B:				
Skeel	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: cemented pan, area reclaim, too sandy.
Algonquin	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Aquepts	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
436A:				
Manary	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
Whittemore	Poor: wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: cemented pan, area reclaim, too sandy.
Springport	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
437D:				
Wurtsmith	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
Meehan	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, too acid.
Deer Park	Good	Probable	Improbable: too sandy.	Poor: too sandy, too acid.
438C:				
Meehan	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, too acid.
Tawas	Poor: wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.
Wurtsmith	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
439D: Deer Park	Good	Probable	Improbable: too sandy.	Poor: too sandy, too acid.

Table 15.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
440B:				
Kawkawlin	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Sims	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
441B, 441C:				
Morganlake	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, too acid.
Nester	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
442D:				
Menominee	Fair: shrink-swell, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Curtisville	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
442E:				
Menominee	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Curtisville	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
443B:				
Kawkawlin	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Allendale	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
Aquepts	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
444B Kawkawlin	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
445A Corsair	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.

Table 15.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
446B:				
Wurtsmith	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
Meehan	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, too acid.
Urban land	Variable	Variable	Variable	Variable.
447A Whittemore	Poor: wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: cemented pan, area reclaim, too sandy.
448A:				
Meehan	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, too acid.
Tawas	Poor: wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.
449A Kokosing	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.

Table 16.--Water Management

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Limitations for-- Aquifer-fed excavated ponds	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Grassed waterways
12B:						
Tawas	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, subsides, frost action.	Ponding, soil blowing.	Wetness.
Au Gres	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave, too acid.	Wetness, droughty.	Wetness, droughty.
13:						
Tawas	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, subsides, frost action.	Ponding, soil blowing.	Wetness.
Lupton	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Ponding, subsides, frost action.	Ponding, soil blowing.	Wetness.
15A:						
Croswell	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Cutbanks cave, too acid.	Wetness, droughty.	Droughty.
Au Gres	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave, too acid.	Wetness, droughty.	Wetness, droughty.
16B Graycalm	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
16D Graycalm	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
17B Croswell	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Slope, cutbanks cave, too acid.	Slope, wetness, droughty.	Droughty.
18A Au Gres	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave, too acid.	Wetness, droughty.	Wetness, droughty.
19 Leafriver	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, subsides, frost action.	Ponding, soil blowing.	Wetness.
25B Kent	Moderate: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope, droughty, percs slowly.	Percs slowly.

Table 16.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
25C: Kent	Severe: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope, droughty, percs slowly.	Slope, percs slowly.
26B: Cublake	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Slope, cutbanks cave, too acid.	Slope, wetness, droughty.	Droughty.
27A: Tacoda	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: no water.	Cutbanks cave	Wetness, droughty.	Wetness, droughty.
28B: East Lake	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
39B: Glennie	Moderate: slope.	Severe: seepage, piping.	Severe: no water.	Percs slowly, slope, cutbanks cave.	Slope, wetness, droughty.	Erodes easily, droughty.
39C: Glennie	Severe: slope.	Severe: seepage, piping.	Severe: no water.	Percs slowly, slope, cutbanks cave.	Slope, wetness, droughty.	Slope, erodes easily, droughty.
40A: Sprinkler	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Frost action	Wetness, droughty, soil blowing.	Wetness, erodes easily, droughty.
47D, 47F: Graycalm	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
53B: Negwegon	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, slope.	Slope, wetness, percs slowly.	Wetness, erodes easily.
53C: Negwegon	Severe: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, slope.	Slope, wetness, percs slowly.	Wetness, slope, erodes easily.
54A: Algonquin	Slight	Severe: wetness.	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly.	Wetness, erodes easily, percs slowly.
55: Springport	Slight	Severe: ponding.	Severe: no water.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Wetness, percs slowly.
56C: Nester	Severe: slope.	Moderate: wetness.	Severe: no water.	Percs slowly, slope.	Slope, wetness.	Slope, percs slowly.
57B: Kawkawlin	Slight	Severe: wetness.	Severe: no water.	Percs slowly, frost action.	Wetness	Wetness, erodes easily, percs slowly.

Table 16.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
58A:						
Wakeley	Severe: seepage.	Severe: ponding.	Severe: no water.	Ponding, percs slowly.	Ponding, droughty.	Wetness, droughty, percs slowly.
Allendale	Severe: seepage.	Severe: hard to pack, wetness.	Severe: no water.	Percs slowly	Wetness, droughty.	Wetness, droughty, percs slowly.
59B:						
Algonquin	Moderate: slope.	Severe: wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Springport	Slight	Severe: ponding.	Severe: no water.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Wetness, percs slowly.
62A Allendale	Severe: seepage.	Severe: hard to pack, wetness.	Severe: no water.	Percs slowly	Wetness, droughty.	Wetness, droughty, percs slowly.
70 Lupton	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Ponding, subsides, frost action.	Ponding, soil blowing.	Wetness.
71 Tawas	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, subsides, frost action.	Ponding, soil blowing.	Wetness.
72 Dorval	Severe: seepage.	Severe: ponding.	Severe: no water.	Ponding, percs slowly, subsides.	Ponding, soil blowing, percs slowly.	Wetness, percs slowly.
75B Rubicon	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
75D, 75E, 75F Rubicon	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
77 Rollaway	Moderate: seepage.	Severe: seepage, piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, flooding, frost action.	Ponding, soil blowing, percs slowly.	Wetness, erodes easily.
78. Pits						
81B Grayling	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
81D, 81E Grayling	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
82C, 82F Udorthents	Variable	Variable	Variable	Variable	Variable	Variable.

Table 16.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
83B Udipsamments	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
84B Zimmerman	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
86:						
Histosols	Slight	Severe: excess humus, ponding.	Slight	Ponding, frost action.	Ponding, soil blowing.	Wetness.
Aquents	Slight	Severe: ponding.	Slight	Ponding, frost action.	Ponding	Wetness.
93B:						
Tacoda	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: no water.	Cutbanks cave	Wetness, droughty.	Wetness, droughty.
Wakeley	Severe: seepage.	Severe: ponding.	Severe: no water.	Ponding, percs slowly.	Ponding, droughty.	Wetness, droughty, percs slowly.
97 Colonville	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Flooding, frost action, cutbanks cave.	Wetness, droughty, soil blowing.	Wetness, droughty.
100D, 100E Curtisville	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, soil blowing, percs slowly.	Slope, percs slowly.
103B Nester	Moderate: slope.	Moderate: wetness.	Severe: no water.	Percs slowly, slope.	Slope, wetness.	Percs slowly.
103C Nester	Severe: slope.	Moderate: wetness.	Severe: no water.	Percs slowly, slope.	Slope, wetness.	Slope, percs slowly.
108B Selkirk	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness	Wetness, erodes easily, percs slowly.
114A Ingalls	Severe: seepage.	Severe: piping, wetness.	Severe: no water.	Cutbanks cave	Wetness, droughty.	Wetness, erodes easily, droughty.
120B Morganlake	Severe: seepage.	Moderate: piping, wetness.	Severe: no water.	Slope, too acid.	Slope, wetness, droughty.	Erodes easily, droughty.
120C Morganlake	Severe: seepage, slope.	Moderate: piping, wetness.	Severe: no water.	Slope, too acid.	Slope, wetness, droughty.	Slope, erodes easily, droughty.
123D Klacking	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.

Table 16.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
124--------------- Evart	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Flooding, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, droughty.
127--------------- Cathro	Severe: seepage.	Severe: piping, ponding.	Severe: slow refill.	Ponding, subsides, frost action.	Ponding, soil blowing.	Wetness.
128--------------- Dawson	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill, cutbanks cave.	Ponding, subsides, frost action.	Ponding, rooting depth.	Wetness, rooting depth.
130--------------- Grousehaven	Severe: seepage.	Severe: excess humus, hard to pack, ponding.	Severe: slow refill.	Ponding, percs slowly, frost action.	Ponding, soil blowing, percs slowly.	Wetness, percs slowly.
159A-------------- Finch	Severe: seepage, cemented pan.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cemented pan, cutbanks cave.	Wetness, droughty.	Wetness, droughty, cemented pan.
182. Pits						
197A-------------- Gladwin	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Wetness, droughty.
209B-------------- Grayling	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
209C, 209D-------- Grayling	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
210B-------------- Grayling	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
210C, 210D, 210E-- Grayling	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
211B, 212B-------- Grayling	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
213B-------------- Graycalm	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
214B-------------- Typic Udipsamments	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Deep to water	Droughty, fast intake.	Droughty.
215B, 216B, 220B-- Typic Udipsamments	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.

Table 16.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
220D, 220E: Typic Udipsamments	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
221B: Typic Udipsamments	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
221C, 221D, 221E: Typic Udipsamments	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
222B: Typic Udipsamments	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
223B:						
Graycalm	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
Grayling	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
223C, 223D, 223E:						
Graycalm	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
Grayling	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
224B: Croswell	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Slope, cutbanks cave, too acid.	Slope, wetness, droughty.	Droughty.
225B: Entic Haplorthods	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
225C: Entic Haplorthods	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
231D, 231E:						
Entic Haplorthods	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
Alfic Haplorthods	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
232B:						
Entic Haplorthods	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
Alfic Haplorthods	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.

Table 16.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
233B:						
Alfic Haplorthods	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
Entic Haplorthods	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
233C, 233D:						
Alfic Haplorthods	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
Entic Haplorthods	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
235B:						
Alfic Haplorthods, sandy over loamy	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
Alfic Haplorthods, sandy-----------	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
235C:						
Alfic Haplorthods, sandy over loamy	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
Alfic Haplorthods, sandy-----------	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
236B-------------- Arenic Eutroboralfs	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
237B-------------- Eutroboralfs	Moderate: slope.	Slight---------	Severe: no water.	Deep to water	Slope----------	Favorable.
237D-------------- Eutroboralfs	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope----------	Slope.
254A:						
Borosaprists.						
Fluvaquents------	Slight---------	Severe: ponding.	Slight---------	Ponding, flooding.	Ponding, flooding.	Wetness.

Table 16.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
254A:						
Aquic Udipsamments	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Flooding, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, droughty.
262A Au Gres	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave, too acid.	Wetness, droughty.	Wetness, droughty.
263A Argic Endoaquods	Slight	Severe: wetness.	Slight	Favorable	Wetness	Wetness.
264A Allendale	Severe: seepage.	Severe: hard to pack, wetness.	Severe: no water.	Percs slowly	Wetness, droughty.	Wetness, droughty, percs slowly.
265B:						
Eutroboralfs	Moderate: slope.	Slight	Severe: no water.	Deep to water	Slope	Favorable.
Allendale	Severe: seepage.	Severe: hard to pack, wetness.	Severe: no water.	Percs slowly	Wetness, droughty.	Wetness, droughty, percs slowly.
266A Typic Duraquods	Severe: seepage, cemented pan.	Severe: seepage, piping.	Severe: no water.	Cemented pan, cutbanks cave.	Wetness, droughty, fast intake.	Droughty, cemented pan, rooting depth.
272:						
Endoaquods.						
Fluvaquents	Slight	Severe: ponding.	Slight	Ponding, flooding.	Ponding, flooding.	Wetness.
273:						
Leafriver	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, subsides, frost action.	Ponding, soil blowing.	Wetness.
Wakeley	Severe: seepage.	Severe: ponding.	Severe: no water.	Ponding, percs slowly.	Ponding, droughty, fast intake.	Wetness, droughty, percs slowly.
274 Typic Endoaquods	Slight	Severe: ponding.	Slight	Ponding	Ponding	Wetness.
280:						
Aquents	Slight	Severe: ponding.	Slight	Ponding, frost action.	Ponding	Wetness.
Histosols	Slight	Severe: excess humus, ponding.	Slight	Ponding, frost action.	Ponding, soil blowing.	Wetness.
281, 282 Borosaprists	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Ponding, frost action.	Ponding, soil blowing.	Wetness.

Table 16.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
343 Sims	Slight	Severe: ponding.	Severe: no water.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Wetness, erodes easily, percs slowly.
355E:						
Crowell	Severe: seepage, cemented pan, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty, cemented pan.
Proper	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Slope, cutbanks cave.	Slope, wetness, droughty.	Droughty, rooting depth.
356E:						
Aquepts	Severe: slope.	Severe: wetness.	Severe: no water.	Slope	Slope, wetness.	Wetness, slope.
Histosols	Slight	Severe: excess humus, ponding.	Slight	Ponding, frost action.	Ponding, soil blowing.	Wetness.
Fluvaquents	Slight	Severe: wetness.	Slight	Flooding, frost action.	Wetness, flooding.	Wetness.
357B:						
Udipsamments	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
Urban land	Variable	Variable	Variable	Variable	Variable	Variable.
360 Wakeley	Severe: seepage.	Severe: ponding.	Severe: no water.	Ponding, percs slowly.	Ponding, droughty.	Wetness, droughty, percs slowly.
367A:						
Whittemore	Severe: seepage, cemented pan.	Severe: seepage, piping, wetness.	Severe: no water.	Percs slowly, cemented pan.	Wetness, droughty.	Wetness, droughty, cemented pan.
Springport	Slight	Severe: ponding.	Severe: no water.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Wetness, percs slowly.
368A:						
Au Gres	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave, too acid.	Wetness, droughty.	Wetness, droughty.
Deford	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, cutbanks cave, too acid.	Ponding, droughty.	Wetness, droughty.
369 Deford	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, cutbanks cave, too acid.	Ponding, droughty.	Wetness, droughty.

Table 16.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
370A: McIvor	Severe: seepage, cemented pan.	Severe: seepage, piping, wetness.	Severe: no water.	Cemented pan, cutbanks cave, too acid.	Wetness, droughty, fast intake.	Wetness, droughty, cemented pan.
371: Springport	Slight	Severe: ponding.	Severe: no water.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Wetness, erodes easily, percs slowly.
372B:						
Proper	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Slope, cutbanks cave.	Slope, wetness, droughty.	Droughty, rooting depth.
Leafriver	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, subsides, frost action.	Ponding, soil blowing.	Wetness.
375: Kanotin	Slight	Severe: piping, ponding.	Severe: no water.	Ponding, cutbanks cave.	Ponding, soil blowing, percs slowly.	Wetness, erodes easily.
377: Wabun	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: no water.	Ponding, cutbanks cave.	Ponding, droughty, fast intake.	Wetness, droughty.
378A: Algonquin	Slight	Severe: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action.	Wetness, droughty, slow intake.	Wetness, droughty, rooting depth.
379A:						
Algonquin	Slight	Severe: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action.	Wetness, droughty, slow intake.	Wetness, droughty, rooting depth.
Springport	Slight	Severe: ponding.	Severe: no water.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Wetness, erodes easily, percs slowly.
380. Access denied						
381A:						
McIvor	Severe: seepage, cemented pan.	Severe: seepage, piping, wetness.	Severe: no water.	Cemented pan, cutbanks cave, too acid.	Wetness, droughty, fast intake.	Wetness, droughty, cemented pan.
Wakeley	Severe: seepage.	Severe: ponding.	Severe: no water.	Ponding, percs slowly.	Ponding, droughty.	Wetness, droughty, percs slowly.
382B: Proper	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Slope, cutbanks cave.	Slope, wetness, droughty.	Droughty, rooting depth.
383B: Wurtsmith	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Slope, cutbanks cave.	Slope, wetness, droughty.	Droughty.

Table 16.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
392-------------- Caffey	Severe: seepage.	Severe: piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, cutbanks cave.	Ponding, droughty, fast intake.	Wetness, erodes easily, droughty.
403B------------- Iargo	Moderate: slope.	Severe: piping.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, percs slowly.
403C------------- Iargo	Severe: slope.	Severe: piping.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, percs slowly.
404A------------- Manary	Slight---------	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action, cutbanks cave.	Wetness, percs slowly, rooting depth.	Wetness, rooting depth.
405B:						
Manary-----------	Slight---------	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action, cutbanks cave.	Wetness, percs slowly, rooting depth.	Wetness, rooting depth.
Iargo------------	Moderate: slope.	Severe: piping.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, percs slowly.
406A------------- Winterfield	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, droughty.
407-------------- Lacota	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, frost action, cutbanks cave.	Ponding, rooting depth.	Wetness, rooting depth.
408-------------- Sims	Slight---------	Severe: ponding.	Severe: no water.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Wetness, erodes easily, percs slowly.
409A:						
Finch------------	Severe: seepage, cemented pan.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cemented pan, cutbanks cave.	Wetness, droughty.	Wetness, droughty, cemented pan.
Deford-----------	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, cutbanks cave, too acid.	Ponding, droughty.	Wetness, droughty.
Au Gres----------	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave, too acid.	Wetness, droughty.	Wetness, droughty.
410B:						
Proper-----------	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Slope, cutbanks cave.	Slope, wetness, droughty.	Droughty, rooting depth.

Table 16.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
410B:						
Finch	Severe: seepage, cemented pan.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cemented pan, cutbanks cave.	Wetness, droughty.	Wetness, droughty, cemented pan.
Deford	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, cutbanks cave, too acid.	Ponding, droughty.	Wetness, droughty.
411A: Meehan	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave, too acid.	Wetness, droughty, fast intake.	Wetness, droughty.
425D: Hottis	Severe: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope, droughty, soil blowing.	Slope, percs slowly.
426B: Coppler	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.
426C: Coppler	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
427: Tonkey	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, frost action, cutbanks cave.	Ponding, droughty, soil blowing.	Wetness, droughty, rooting depth.
429D: Menominee	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
430D, 430E: Mongo	Severe: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, percs slowly.
431B: Skeel	Severe: seepage, cemented pan.	Moderate: wetness.	Severe: no water.	Cemented pan, slope.	Slope, wetness, droughty.	Droughty, cemented pan, rooting depth.
432B:						
Wurtsmith	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Slope, cutbanks cave.	Slope, wetness, droughty.	Droughty.
Meehan	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave, too acid.	Wetness, droughty, fast intake.	Wetness, droughty.
433B:						
Morganlake	Severe: seepage.	Moderate: piping, wetness.	Severe: no water.	Slope, too acid.	Slope, wetness, droughty.	Erodes easily, droughty.
Graycalm	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Droughty.

Table 16.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
434D:						
Graycalm	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
Menominee	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
Morganlake	Severe: seepage, slope.	Moderate: piping, wetness.	Severe: no water.	Slope, too acid.	Slope, wetness, droughty.	Slope, erodes easily, droughty.
435B:						
Skeel	Severe: seepage, cemented pan.	Moderate: wetness.	Severe: no water.	Cemented pan, slope.	Slope, wetness, droughty.	Droughty, cemented pan, rooting depth.
Algonquin	Slight	Severe: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action.	Wetness, droughty, slow intake.	Wetness, droughty, rooting depth.
Aquepts	Slight	Severe: ponding.	Slight	Ponding	Ponding	Wetness.
436A:						
Manary	Slight	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action, cutbanks cave.	Wetness, percs slowly, rooting depth.	Wetness, rooting depth.
Whittemore	Severe: seepage, cemented pan.	Severe: seepage, piping, wetness.	Severe: no water.	Percs slowly, cemented pan.	Wetness, droughty.	Wetness, droughty, cemented pan.
Springport	Slight	Severe: ponding.	Severe: no water.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Wetness, percs slowly.
437D:						
Wurtsmith	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Slope, cutbanks cave.	Slope, wetness, droughty.	Droughty.
Meehan	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave, too acid.	Wetness, droughty, fast intake.	Wetness, droughty.
Deer Park	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
438C:						
Meehan	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave, too acid.	Wetness, droughty, fast intake.	Wetness, droughty.

Table 16.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
438C:						
Tawas	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, subsides, frost action.	Ponding, soil blowing.	Wetness.
Wurtsmith	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Slope, cutbanks cave.	Slope, wetness, droughty.	Droughty.
439D Deer Park	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
440B:						
Kawkawlin	Slight	Severe: wetness.	Severe: no water.	Percs slowly, frost action.	Wetness	Wetness, erodes easily, percs slowly.
Sims	Slight	Severe: ponding.	Severe: no water.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Wetness, erodes easily, percs slowly.
441B:						
Morganlake	Severe: seepage.	Moderate: piping, wetness.	Severe: no water.	Slope, too acid.	Slope, wetness, droughty.	Erodes easily, droughty.
Nester	Moderate: slope.	Moderate: wetness.	Severe: no water.	Percs slowly, slope.	Slope, wetness.	Percs slowly.
441C:						
Morganlake	Severe: seepage, slope.	Moderate: piping, wetness.	Severe: no water.	Slope, too acid.	Slope, wetness, droughty.	Slope, erodes easily, droughty.
Nester	Severe: slope.	Moderate: wetness.	Severe: no water.	Percs slowly, slope.	Slope, wetness.	Slope, percs slowly.
442D, 442E:						
Menominee	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, droughty.
Curtisville	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, soil blowing, percs slowly.	Slope, percs slowly.
443B:						
Kawkawlin	Slight	Severe: wetness.	Severe: no water.	Percs slowly, frost action.	Wetness, soil blowing.	Wetness, percs slowly.
Allendale	Severe: seepage.	Severe: hard to pack, wetness.	Severe: no water.	Percs slowly	Wetness, droughty.	Wetness, droughty, percs slowly.
Aquepts	Slight	Severe: ponding.	Slight	Ponding	Ponding	Wetness.
444B Kawkawlin	Slight	Severe: wetness.	Severe: no water.	Percs slowly, frost action.	Wetness, soil blowing.	Wetness, percs slowly.

Table 16.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
445A--------------- Corsair	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Cutbanks cave	Wetness, droughty, soil blowing.	Wetness, droughty, rooting depth.
446B:						
Wurtsmith---------	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Slope, cutbanks cave.	Slope, wetness, droughty.	Droughty.
Meehan------------	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave, too acid.	Wetness, droughty, fast intake.	Wetness, droughty.
Urban land--------	Variable--------	Variable--------	Variable--------	Variable--------	Variable--------	Variable.
447A--------------- Whittemore	Severe: seepage, cemented pan.	Severe: seepage, piping, wetness.	Severe: no water.	Percs slowly, cemented pan.	Wetness, droughty.	Wetness, droughty, cemented pan.
448A:						
Meehan------------	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave, too acid.	Wetness, droughty, fast intake.	Wetness, droughty.
Tawas-------------	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, subsides, frost action.	Ponding, soil blowing.	Wetness.
449A--------------- Kokosing	Severe: seepage.	Severe: wetness.	Severe: no water.	Frost action---	Wetness, droughty, fast intake.	Wetness, droughty.

Table 17.--Engineering Index Properties

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct	Pct					Pct	
12B:												
Tawas--------	0-24	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	24-80	Sand, loamy fine sand, gravelly sand.	SP, SM, SP-SM	A-3, A-2-4, A-4, A-1-b	0	0	80-100	60-100	30-80	0-40	0-14	NP
Au Gres------	0-9	Sand----------	SM, SP-SM, SP	A-2-4, A-3, A-1-b	0	0	95-100	75-100	35-70	0-15	0-14	NP
	9-29	Sand, loamy sand.	SP-SM, SM, SC-SM, SP	A-2-4, A-3, A-1-b	0	0	95-100	75-100	35-75	0-30	0-25	NP-7
	29-80	Sand----------	SP-SM, SM, SP	A-3, A-2-4, A-1-b	0	0	95-100	75-100	35-70	0-15	0-14	NP
13:												
Tawas--------	0-24	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	24-80	Sand, loamy fine sand, gravelly sand.	SP, SM, SP-SM	A-3, A-2-4, A-4, A-1-b	0	0	80-100	60-100	30-80	0-40	0-14	NP
Lupton-------	0-30	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	30-80	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
15A:												
Croswell-----	0-7	Sand----------	SP-SM, SM	A-3, A-2-4, A-1-b	0	0	90-100	75-100	40-70	5-15	0-14	NP
	7-26	Sand, loamy sand.	SP-SM, SM, SP	A-3, A-2-4, A-1-b	0	0	90-100	75-100	40-75	3-30	0-14	NP
	26-36	Sand, loamy sand.	SP-SM, SM, SP	A-3, A-2-4, A-1-b	0	0	90-100	75-100	40-75	3-30	0-14	NP
	36-80	Sand----------	SP-SM, SM, SP	A-3, A-2-4, A-1-b	0	0	90-100	75-100	40-70	3-15	0-14	NP
Au Gres------	0-9	Sand----------	SM, SP-SM, SP	A-2-4, A-3, A-1-b	0	0	95-100	75-100	35-70	0-15	0-14	NP
	9-29	Sand, loamy sand.	SP-SM, SM, SC-SM, SP	A-2-4, A-3, A-1-b	0	0	95-100	75-100	35-75	0-30	0-25	NP-7
	29-80	Sand----------	SP-SM, SM, SP	A-3, A-2-4, A-1-b	0	0	95-100	75-100	35-70	0-15	0-14	NP

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 10 inches	Fragments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
16B----------- Graycalm	0-4	Sand----------	SM, SP-SM, SP	A-2, A-1, A-3	0	0-5	95-100	75-100	35-55	0-15	0-14	NP
	4-45	Sand, loamy sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0-5	95-100	75-100	30-75	0-30	0-14	NP
	45-80	Sand, loamy sand, loamy coarse sand.	SM, SP-SM, SP	A-2, A-1, A-3	0	0-5	95-100	75-100	30-75	0-30	0-14	NP
16D----------- Graycalm	0-1	Sand----------	SM, SP-SM, SP	A-2, A-1, A-3	0	0-5	95-100	75-100	35-55	0-15	0-14	NP
	1-4	Sand, loamy sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0-5	95-100	75-100	30-75	0-30	0-14	NP
	4-46	Sand, loamy sand, loamy coarse sand.	SM, SP-SM, SP	A-2, A-1, A-3	0	0-5	95-100	75-100	30-75	0-30	0-14	NP
	46-80	Sand, coarse sand.	SP, SP-SM, SM	A-2, A-1, A-3	0	0-5	95-100	75-100	35-55	0-15	0-14	NP
17B----------- Croswell	0-7	Sand----------	SP-SM, SM	A-3, A-2-4, A-1-b	0	0	90-100	75-100	40-70	5-15	0-14	NP
	7-26	Sand, loamy sand.	SP-SM, SM, SP	A-3, A-2-4, A-1-b	0	0	90-100	75-100	40-75	3-30	0-14	NP
	26-36	Sand, loamy sand.	SP-SM, SM, SP	A-3, A-2-4, A-1-b	0	0	90-100	75-100	40-75	3-30	0-14	NP
	36-80	Sand----------	SP-SM, SM, SP	A-3, A-2-4, A-1-b	0	0	90-100	75-100	40-70	3-15	0-14	NP
18A----------- Au Gres	0-9	Sand----------	SM, SP-SM, SP	A-2-4, A-3, A-1-b	0	0	95-100	75-100	35-70	0-15	0-14	NP
	9-29	Sand, loamy sand.	SP-SM, SM, SC-SM, SP	A-2-4, A-3, A-1-b	0	0	95-100	75-100	35-75	0-30	0-25	NP-7
	29-80	Sand----------	SP-SM, SM, SP	A-3, A-2-4, A-1-b	0	0	95-100	75-100	35-70	0-15	0-14	NP
19------------ Leafriver	0-10	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	10-14	Loamy sand, fine sandy loam, fine sand.	SM	A-4, A-2-4	0	0	100	95-100	55-80	15-50	15-20	NP-4
	14-80	Loamy sand, fine sand, sand.	SM, SP-SM, SP	A-3, A-2, A-2-4, A-1	0	0	95-100	80-100	45-70	3-35	---	NP
25B, 25C------ Kent	0-8	Sandy loam----	SM, CL, SC, ML	A-4, A-2	0	0-4	95-100	90-100	55-85	25-55	10-30	NP-10
	8-26	Clay, silty clay.	CH	A-7	0	0-4	95-100	90-100	85-100	75-95	50-70	25-40
	26-80	Clay, silty clay.	CH	A-7	0	0-4	95-100	90-100	85-100	75-95	50-70	25-40

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct	Pct					Pct	
26B----------- Cublake	0-3	Sand----------	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-70	5-25	<18	NP-3
	3-5	Loamy sand, sand, loamy fine sand.	SM, SP-SM	A-4, A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-95	5-50	<20	NP-4
	5-24	Loamy sand, sand, loamy fine sand.	SM, SP-SM	A-4, A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-95	5-50	<20	NP-4
	24-45	Sand, fine sand, loamy sand.	SM, SP-SM	A-3, A-1-b	0	0	80-100	75-100	20-85	5-35	---	NP
	45-80	Stratified sandy loam to silt loam.	SC, SC-SM, CL, CL-ML	A-4, A-6, A-2-4, A-2-6	0	0	95-100	90-100	50-85	25-60	20-35	4-15
27A----------- Tacoda	0-3	Sand----------	SM, SP-SM, SP	A-2-4, A-2, A-3	0	0	100	85-100	50-70	0-15	---	NP
	3-15	Sand----------	SM, SP-SM, SM	A-2, A-3	0	0	100	85-100	50-70	5-15	---	NP
	15-23	Sand----------	SM, SP-SM	A-2, A-3	0	0	100	85-100	50-70	5-15	---	NP
	23-45	Sand----------	SM, SP-SM	A-2, A-3	0	0	100	85-100	50-70	5-15	---	NP
	45-80	Clay, silty clay.	CH, CL	A-7	0	0	100	100	90-100	75-95	45-60	30-40
28B----------- East Lake	0-7	Sand----------	SM, SP-SM, SP	A-1, A-2-4, A-3	0	0-15	95-100	85-100	40-70	0-15	---	NP
	7-30	Sand, loamy sand, gravelly coarse sand.	SM, SP-SM, SP	A-1, A-2-4, A-3	0	0-15	85-100	70-100	35-75	0-30	---	NP
	30-80	Stratified very gravelly sand to sand.	GP, SP-SM, SP, GP-GM	A-1, A-3, A-2-4	0	0-15	40-75	25-60	20-55	0-10	---	NP
39B, 39C------ Glennie	0-5	Loamy sand----	SM, SP-SM	A-2, A-1	0	0-10	90-100	85-100	45-75	10-30	0-14	NP
	5-18	Loamy sand, sandy loam.	SM, SC-SM, SP-SM	A-2-4, A-1, A-4	0	0-10	90-100	85-100	45-75	10-40	0-25	NP-7
	18-38	Loamy sand, sandy loam, loam.	SM, SC, ML, CL	A-2-4, A-4, A-2-6	0	0-10	90-100	85-100	45-85	10-75	0-35	NP-15
	38-44	Loamy sand, sandy loam, sandy clay loam.	SM, SC, ML, CL	A-2-4, A-4, A-6	0	0-10	90-100	85-100	45-85	10-75	0-35	NP-15
	44-54	Clay, clay loam, sandy clay loam.	SC, CL, CH	A-7, A-6	0	0-10	90-100	85-100	65-95	45-90	30-65	10-35
	54-85	Sandy clay loam, clay loam, sandy loam.	SC, CL	A-7, A-6, A-4	0	0-10	90-100	85-100	65-90	45-75	25-50	7-25

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
40A----------- Sprinkler	0-5	Sandy loam----	SC-SM, SM, SC	A-2-4, A-4	0	0-5	95-100	90-100	55-70	25-40	0-30	NP-10
	5-13	Sandy loam----	SC-SM, SM, SC	A-2-4, A-4	0	0-5	95-100	90-100	55-70	25-40	0-30	NP-10
	13-28	Sandy loam, loam, clay loam.	SC, CL	A-6, A-7-6	0	0-5	95-100	90-100	55-90	35-80	25-45	10-20
	28-35	Loam, clay loam.	CL	A-6, A-7	0	0-5	95-100	90-100	75-90	55-80	25-45	10-20
	35-44	Loam, clay loam.	CL	A-6, A-7	0	0-5	95-100	90-100	75-90	55-80	25-45	10-20
	44-80	Loam, clay loam.	CL	A-6, A-7	0	0-5	95-100	90-100	75-90	55-80	25-45	10-20
47D, 47F------ Graycalm	0-4	Sand----------	SM, SP-SM, SP	A-2, A-1, A-3	0	0-5	95-100	75-100	35-55	0-15	0-14	NP
	4-45	Sand, loamy sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0-5	95-100	75-100	30-75	0-30	0-14	NP
	45-80	Sand, loamy sand, loamy coarse sand.	SM, SP-SM, SP	A-2, A-1, A-3	0	0-5	95-100	75-100	30-75	0-30	0-14	NP
53B----------- Negwegon	0-6	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	95-100	90-100	80-100	65-90	20-40	5-15
	6-34	Silty clay loam, silty clay, clay.	CL, CH	A-7	0	0	95-100	90-100	85-100	75-95	40-65	20-40
	34-80	Stratified silty clay to silt loam.	CL, CH	A-7	0	0	95-100	90-100	80-100	65-95	40-65	20-40
53C----------- Negwegon	0-6	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	95-100	90-100	80-100	65-90	20-40	5-15
	6-34	Silty clay loam, silty clay, clay.	CL, CH	A-7	0	0	95-100	90-100	85-100	75-95	40-65	20-40
	34-80	Stratified silty clay to silt loam.	CL, CH	A-7	0	0	95-100	90-100	80-100	65-95	40-65	20-40
54A----------- Algonquin	0-7	Silt loam-----	CL	A-4, A-6	0	0-2	95-100	95-100	80-100	70-90	25-40	7-15
	7-14	Silty clay, silty clay loam.	CL, CH	A-7	0	0-2	95-100	95-100	85-100	80-95	40-65	20-40
	14-29	Silty clay, silty clay loam.	CL, CH	A-7	0	0-2	95-100	95-100	85-100	80-95	40-65	20-40
	29-80	Silty clay, silty clay loam.	CL, CH	A-7	0	0-2	95-100	95-100	85-100	80-95	40-65	20-40
55------------ Springport	0-8	Clay loam-----	CL	A-6, A-7	0	0-2	95-100	95-100	85-100	70-80	35-50	15-25
	8-12	Silty clay, clay.	CL, CH	A-7	0	0-2	95-100	95-100	85-100	80-95	40-65	20-40
	12-27	Silty clay, silty clay loam, clay.	CL, CH	A-7	0	0-2	95-100	95-100	85-100	80-95	40-65	20-40
	27-80	Silty clay, silty clay loam.	CL, CH	A-7	0	0-2	95-100	95-100	85-100	80-95	40-65	20-40

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
56C----------- Nester	0-9	Loam----------	ML, CL, CL-ML	A-4, A-6	0	0-5	90-95	75-95	65-100	50-90	15-35	2-15
	9-19	Silt loam, loam, sandy loam.	ML, CL, SC, SM	A-4, A-6, A-2-4	0	0-5	90-95	75-95	45-95	20-90	0-35	NP-15
	19-40	Clay loam, silty clay loam, clay.	CL, CH	A-7	0	0-5	90-95	75-95	75-95	55-90	40-55	20-30
	40-80	Clay loam, silty clay loam.	CL	A-7	0	0-5	90-95	75-95	70-95	50-90	40-50	15-25
57B----------- Kawkawlin	0-10	Loam----------	ML, CL, CL-ML	A-4, A-6	0	0-5	95-100	85-100	70-95	50-75	20-40	2-15
	10-29	Clay loam, silty clay loam, clay.	CL, CH	A-7	0	0-5	95-100	85-100	75-100	55-95	40-55	20-30
	29-80	Clay loam, silty clay loam.	CL	A-6, A-7	0	0-5	95-100	85-100	75-100	50-95	35-50	15-25
58A:												
Wakeley------	0-5	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	5-27	Sand, loamy sand, loamy fine sand.	SP, SP-SM, SM, SC-SM	A-2-4, A-3, A-4	0	0-5	95-100	75-100	35-95	0-50	<25	NP-7
	27-80	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	0	95-100	90-100	85-100	75-95	40-65	20-40
Allendale----	0-6	Sand----------	SM, SW-SM, SP-SM	A-2-4, A-3, A-1-b	0	0	95-100	90-100	45-80	5-35	0-14	NP
	6-32	Sand, loamy sand, loamy fine sand.	SM, SP-SM	A-2-4, A-3, A-4, A-1-b	0	0	95-100	90-100	45-80	5-40	0-14	NP
	32-80	Silty clay, clay.	CH, MH	A-7	0	0	100	90-100	90-100	75-95	50-70	20-40
59B:												
Algonquin----	0-7	Silt loam-----	CL	A-4, A-6	0	0-2	95-100	95-100	80-100	70-90	25-40	7-15
	7-14	Silty clay, silty clay loam.	CL, CH	A-7	0	0-2	95-100	95-100	85-100	80-95	40-65	20-40
	14-29	Silty clay, silty clay loam.	CL, CH	A-7	0	0-2	95-100	95-100	85-100	80-95	40-65	20-40
	29-80	Silty clay, silty clay loam.	CL, CH	A-7	0	0-2	95-100	95-100	85-100	80-95	40-65	20-40
Springport---	0-8	Clay loam-----	CL	A-6, A-7	0	0-2	95-100	95-100	85-100	70-80	35-50	15-25
	8-12	Silty clay, clay.	CL, CH	A-7	0	0-2	95-100	95-100	85-100	80-95	40-65	20-40
	12-27	Silty clay, silty clay loam, clay.	CL, CH	A-7	0	0-2	95-100	95-100	85-100	80-95	40-65	20-40
	27-80	Silty clay, silty clay loam.	CL, CH	A-7	0	0-2	95-100	95-100	85-100	80-95	40-65	20-40

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct	Pct					Pct	
62A----------- Allendale	0-6	Loamy sand----	SM, SP-SM	A-2-4, A-1-b, A-4	0	0	95-100	90-100	45-80	10-40	0-14	NP
	6-32	Sand, loamy sand, loamy fine sand.	SM, SP-SM	A-2-4, A-3, A-4, A-1-b	0	0	95-100	90-100	45-80	5-40	0-14	NP
	32-80	Silty clay, clay.	CH, MH	A-7	0	0	100	90-100	90-100	75-95	50-70	20-40
70------------ Lupton	0-30	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	30-80	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
71------------ Tawas	0-24	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	24-80	Sand, loamy fine sand, gravelly sand.	SP, SM, SP-SM	A-3, A-2-4, A-4, A-1-b	0	0	80-100	60-100	30-80	0-40	0-14	NP
72------------ Dorval	0-18	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	18-80	Silty clay loam, silty clay, clay.	CH, CL	A-7	0	0	100	90-100	90-100	80-100	45-70	25-40
75B, 75D------ Rubicon	0-8	Sand----------	SM, SP-SM, SP	A-2, A-3, A-1	0	0	95-100	75-100	35-70	0-15	---	NP
	8-23	Sand----------	SM, SP-SM, SP	A-2, A-3, A-1	0	0	95-100	75-100	35-70	0-15	---	NP
	23-80	Sand, coarse sand.	SP, SP-SM, SM	A-1, A-2, A-3	0	0	95-100	75-100	30-70	0-15	---	NP
75E, 75F------ Rubicon	0-4	Sand----------	SM, SP-SM, SP	A-2, A-3, A-1	0	0	95-100	75-100	35-70	0-15	---	NP
	4-23	Sand----------	SM, SP-SM, SP	A-2, A-3, A-1	0	0	95-100	75-100	35-70	0-15	---	NP
	23-80	Sand, coarse sand.	SP, SP-SM, SM	A-1, A-2, A-3	0	0	95-100	75-100	30-70	0-15	---	NP
77------------ Rollaway	0-9	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	9-13	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	90-100	70-90	20-30	6-11
	13-18	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	90-100	70-90	20-30	6-11
	18-55	Loamy sand, sandy loam.	SC, SM, SC-SM	A-2-4, A-4	0	0	100	100	50-75	15-40	<25	NP-8
	55-80	Silty clay----	CL, CH	A-7-6	0	0	100	100	80-100	80-100	45-65	25-40
78. Pits												
81B, 81D, 81E- Grayling	0-3	Sand----------	SM, SP-SM, SP	A-1, A-2, A-3	0	0	95-100	90-100	45-70	3-15	0-14	NP
	3-20	Sand----------	SP, SP-SM, SM	A-1, A-2, A-3	0	0	95-100	90-100	45-70	3-15	0-14	NP
	20-41	Sand, coarse sand.	SP, SP-SM, SM	A-1, A-2, A-3	0	0	95-100	90-100	40-70	0-15	0-14	NP
	41-80	Sand, coarse sand.	SP, SP-SM, SM	A-1, A-2, A-3	0	0	95-100	90-100	40-70	0-15	0-14	NP
82C----------- Udorthents	0-12	Silty clay loam.	---	---	---	---	---	---	---	---	---	NP-15
	12-80	Variable------	---	---	---	---	---	---	---	---	---	---

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct	Pct					Pct	
82F----------- Udorthents	0-24	Silty clay loam.	---	---	---	---	---	---	---	---	---	NP-15
	24-80	Variable------	---	---	---	---	---	---	---	---	---	---
83B----------- Udipsamments	0-80	Loamy sand----	SP, SP-SM, SM	A-1, A-2, A-3	0	0	85-100	75-100	30-75	0-25	0-14	NP
84B----------- Zimmerman	0-2	Loamy fine sand.	SM	A-2	0	0	100	100	95-100	15-30	<20	NP
	2-80	Fine sand, loamy fine sand.	SM, SP-SM	A-2, A-3	0	0	100	100	95-100	5-20	<20	NP
86:												
Histosols----	0-51	Muck----------	PT	A-8	0	0	---	---	---	---	---	NP
	51-80	Variable------	---	---	---	---	---	---	---	---	---	---
Aquents------	0-80	Variable------	---	---	---	---	---	---	---	---	---	---
93B:												
Tacoda-------	0-3	Sand----------	SM, SP-SM, SP	A-2-4, A-2, A-3	0	0	100	85-100	50-70	0-15	---	NP
	3-15	Sand----------	SM, SP-SM, SM	A-2, A-3	0	0	100	85-100	50-70	5-15	---	NP
	15-23	Sand----------	SM, SP-SM	A-2, A-3	0	0	100	85-100	50-70	5-15	---	NP
	23-45	Sand----------	SM, SP-SM	A-2, A-3	0	0	100	85-100	50-70	5-15	---	NP
	45-80	Clay, silty clay.	CH, CL	A-7	0	0	100	100	90-100	75-95	45-60	30-40
Wakeley------	0-5	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	5-27	Sand, loamy sand, loamy fine sand.	SP, SP-SM, SM, SC-SM	A-2-4, A-3, A-4	0	0-5	95-100	75-100	35-95	0-50	<25	NP-7
	27-80	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	0	95-100	90-100	85-100	75-95	40-65	20-40
97------------ Colonville	0-16	Very fine sandy loam.	CL, CL-ML	A-4	0	0	100	100	85-95	50-65	20-25	4-8
	16-80	Very fine sandy loam, sand, loamy fine sand.	SM, SC, ML, CL	A-4, A-1-b, A-2-4	0	0	90-100	75-100	35-85	5-55	0-30	NP-9
100D, 100E---- Curtisville	0-5	Sandy loam----	SC-SM, SC	A-2, A-4	0	0-5	90-100	75-100	45-75	20-40	21-30	4-11
	5-16	Sandy loam, clay loam, loam.	CL, SC	A-2, A-4, A-6	0	0-5	90-100	75-100	45-100	20-90	25-39	7-18
	16-29	Clay, clay loam, silty clay loam.	CL, CH	A-7	0	0-5	90-100	75-100	75-100	55-95	44-53	21-28
	29-80	Clay loam, silty clay loam.	CL	A-7	0	0-5	90-100	75-100	75-100	50-95	39-48	18-25

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 10 inches	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
103B, 103C----- Nester	0-6	Sandy loam----	SM, SC, SC, ML	A-2-4, A-4, A-1-b	0	0-5	90-95	75-95	45-85	20-55	0-30	NP-10
	6-10	Silt loam, loam, sandy loam.	ML, CL, SC, SM	A-4, A-6, A-2-4	0	0-5	90-95	75-95	45-95	20-90	0-35	NP-15
	10-22	Clay loam, silty clay loam, clay.	CL, CH	A-7	0	0-5	90-95	75-95	75-95	55-90	40-55	20-30
	22-80	Clay loam, silty clay loam.	CL	A-7	0	0-5	90-95	75-95	70-95	50-90	40-50	15-25
108B---------- Selkirk	0-9	Loam----------	CL-ML, CL	A-4, A-6	0	0-5	90-100	85-95	70-95	50-85	25-40	5-20
	9-15	Sandy loam, loam, clay loam.	SC, CL	A-6, A-7, A-2	0	0-5	90-100	85-95	70-90	30-60	25-45	10-20
	15-21	Clay, silty clay.	CH	A-7	0	0-5	90-100	85-95	80-95	65-90	50-70	25-40
	21-80	Clay, silty clay.	CH	A-7	0	0-5	90-100	85-95	80-95	65-90	50-70	25-40
114A---------- Ingalls	0-12	Sand----------	SM, SP-SM	A-2, A-3, A-1	0	0-8	90-100	85-100	40-80	5-35	---	NP
	12-22	Loamy sand, sand, fine sand.	SM, SP-SM	A-2, A-3, A-1	0	0-8	90-100	85-100	40-80	5-35	---	NP
	22-80	Stratified silt to loamy fine sand.	CL, CL-ML, SC, SC-SM	A-6, A-4	0	0	95-100	90-100	65-100	45-95	20-35	4-15
120B, 120C---- Morganlake	0-4	Sand----------	SM, SP-SM	A-3	0	0	95-100	90-100	50-70	5-15	0-14	NP
	4-23	Sand----------	SP-SM, SM	A-3	0	0	95-100	90-100	50-70	5-15	0-14	NP
	23-29	Loamy sand----	SP-SM, SM	A-3	0	0	95-100	90-100	50-75	5-30	0-14	NP
	29-47	Clay loam-----	CL	A-6, A-7	0	0	80-100	75-95	65-95	55-75	25-45	10-20
	47-80	Clay loam, silty clay loam.	CL	A-6, A-7	0	0	80-100	75-95	65-95	55-75	25-45	10-20
123D---------- Klacking	0-2	Sand----------	SP-SM, SM, SP	A-2, A-1, A-3	0	0-5	90-100	75-100	35-75	0-15	---	NP
	2-34	Sand, loamy sand.	SP-SM, SM, SP	A-2, A-1, A-3	0	0-5	90-100	75-100	35-75	0-30	---	NP
	34-80	Sand, loamy sand, sandy loam.	SP-SM, SM, SP, SC-SM	A-2, A-4, A-1, A-3	0	0-5	90-100	75-100	35-70	0-40	<25	NP-7
124----------- Evart	0-14	Sand----------	SM, SP-SM	A-2, A-1, A-3	0	0-5	95-100	90-100	45-80	5-25	0-20	NP-4
	14-80	Fine sand, loamy sand, gravelly coarse sand.	SM, SP-SM, SC-SM, SP	A-1, A-3, A-2	0	0-5	95-100	60-100	30-75	0-20	0-25	NP-7
127----------- Cathro	0-19	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	19-30	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	30-80	Loam, silty clay loam, sandy loam.	SC-SM, CL-ML, SC, CL	A-4, A-6	0	0-5	80-100	65-100	60-100	35-90	20-40	4-20

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct	Pct					Pct	
128-----------Dawson	0-3	Peat-----------	PT	A-8	0	0	---	---	---	---	---	---
	3-27	Muck-----------	PT	A-8	0	0	---	---	---	---	---	---
	27-80	Sand, gravelly sand, very gravelly very fine sand.	SP, SM, SC, GP	A-2, A-3, A-1, A-4	0	0	45-100	35-100	15-90	0-45	<20	NP-10
130-----------Grousehaven	0-12	Muck-----------	PT	A-8	0	0	---	---	---	---	0-14	NP
	12-80	Marl-----------	OH, MH	A-8, A-5, A-7	0	0	100	95-100	80-90	60-80	50-90	NP-20
159A----------Finch	0-3	Sand-----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	---	NP
	3-12	Sand-----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	---	NP
	12-21	Sand-----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	---	NP
	21-80	Sand, fine sand, loamy sand.	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	---	NP
182. Pits												
197A----------Gladwin	0-7	Loamy sand----	SM, SP-SM	A-2-4, A-1-b	0	0-5	95-100	75-95	45-70	10-30	0-20	NP-4
	7-22	Sand, loamy sand.	SM, SP-SM, SC-SM	A-1-b, A-2-4, A-3	0	0-5	95-100	75-95	35-70	5-30	0-25	NP-5
	22-26	Gravelly loamy sand, sandy loam, gravelly sandy loam.	SM, SC-SM, SC, A-3	A-1-b, A-2-4	0	0-10	45-100	40-95	15-70	10-35	0-30	NP-9
	26-80	Stratified sand to very gravelly sand.	SP, GP, SP-SM, GP-GM	A-1	0	0-10	40-80	40-70	20-45	0-10	0-14	NP
209B, 209C, 209D---------Grayling	0-2	Sand-----------	SM, SP-SM	A-3, A-1-b, A-2-4	0	0	90-100	85-100	40-70	5-15	0-14	NP
	2-29	Sand-----------	SM, SP-SM	A-3, A-1-b, A-2-4	0	0	90-100	85-100	40-70	5-15	0-14	NP
	29-70	Sand, coarse sand.	SM, SP-SM, SP	A-3, A-1-b, A-2-4	0	0	90-100	85-100	40-70	0-15	0-14	NP
	70-99	Sand-----------	SM, SP-SM, SP	A-3, A-1-b, A-2-4	0	0	90-100	85-100	40-70	0-15	0-14	NP
210B, 210C, 210D, 210E---Grayling	0-2	Sand-----------	SM, SP-SM, SP	A-1, A-2, A-3	0	0	95-100	90-100	45-70	3-15	0-14	NP
	2-29	Sand, coarse sand.	SP, SP-SM, SM	A-1, A-2, A-3	0	0	95-100	90-100	40-70	0-15	0-14	NP
	29-99	Sand, coarse sand.	SP, SP-SM, SM	A-1, A-2, A-3	0	0	95-100	90-100	40-70	0-15	0-14	NP

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct	Pct					Pct	
211B---------- Grayling	0-3	Sand----------	SM, SP-SM	A-3, A-1, A-2	0	0	90-100	85-100	40-70	5-15	0-14	NP
	3-60	Sand----------	SM, SP-SM	A-3, A-1, A-2	0	0	90-100	85-100	40-70	5-15	0-14	NP
	60-80	Sand, coarse sand.	SM, SP-SM, SP	A-3, A-1, A-2	0	0	90-100	85-100	40-70	0-15	0-14	NP
	80-99	Stratified sand to sandy loam.	SM, SC-SM, SC, SP-SM	A-3, A-1, A-2, A-4	0	0	90-100	85-100	40-70	5-40	0-30	NP-10
212B---------- Grayling	0-3	Sand----------	SM, SP-SM	A-1, A-2, A-3	0	0	90-100	85-100	45-70	5-15	---	NP
	3-30	Sand----------	SP-SM, SM	A-1, A-2, A-3	0	0	90-100	85-100	45-70	5-15	---	NP
	30-99	Sand, coarse sand.	SP, SP-SM, SM	A-1, A-2, A-3	0	0	90-100	85-100	40-70	0-15	---	NP
213B---------- Graycalm	0-1	Sand----------	SM, SP-SM, SP	A-2, A-1, A-3	0	0-5	95-100	75-100	35-55	0-15	0-14	NP
	1-46	Sand, loamy sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0-5	95-100	75-100	30-75	0-30	0-14	NP
	46-70	Sand, loamy sand, loamy coarse sand.	SM, SP-SM, SP	A-2, A-1, A-3	0	0-5	95-100	75-100	30-75	0-30	0-14	NP
	70-99	Sand, coarse sand.	SP, SP-SM, SM	A-2, A-1, A-3	0	0-5	95-100	75-100	35-55	0-15	0-14	NP
214B---------- Typic Udipsamments	0-2	Sand----------	SM, SP-SM	A-3, A-1, A-2	0	0	90-100	85-100	40-70	5-15	0-14	NP
	2-37	Sand----------	SM, SP-SM	A-3, A-1, A-2	0	0	90-100	85-100	40-70	5-15	0-14	NP
	37-99	Sand, coarse sand.	SM, SP-SM	A-3, A-1, A-2	0	0	90-100	85-100	40-70	5-15	0-14	NP
215B, 216B---- Typic Udipsamments	0-2	Sand----------	SM, SP-SM	A-3, A-1, A-2	0	0	90-100	85-100	40-70	5-15	0-14	NP
	2-25	Sand----------	SM, SP-SM	A-3, A-1, A-2	0	0	90-100	85-100	40-70	5-15	0-14	NP
	25-75	Sand, coarse sand.	SM, SP-SM	A-3, A-1, A-2	0	0	90-100	85-100	40-70	5-15	0-14	NP
	75-95	Sandy loam, sandy clay loam.	SC, CL, CL-ML, SC-SM	A-2, A-4, A-6	0	0	90-100	85-100	50-90	25-55	20-40	4-18
220B, 220D, 220E--------- Typic Udipsamments	0-4	Sand----------	SM, SP-SM	A-3, A-1-b, A-2-4	0	0	90-100	85-100	40-70	5-15	0-14	NP
	4-40	Sand----------	SM, SP-SM	A-3, A-1-b, A-2-4	0	0	90-100	85-100	40-70	5-15	0-14	NP
	40-99	Sand, coarse sand.	SP, SP-SM	A-3, A-1-b, A-2-4	0	0	90-100	85-100	40-70	0-5	0-14	NP

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 10 inches	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
221B, 221C, 221D, 221E---Typic Udipsamments	0-3	Sand----------	SM, SP-SM	A-3, A-1, A-2	0	0	90-100	85-100	40-70	5-15	0-14	NP
	3-45	Sand----------	SM, SP-SM	A-3, A-1, A-2	0	0	90-100	85-100	40-70	5-15	0-14	NP
	45-75	Sand, coarse sand.	SM, SP-SM	A-3, A-1, A-2	0	0	90-100	85-100	40-70	5-15	0-14	NP
	75-99	Stratified sand to sandy loam.	SM, SC-SM, SC, SP-SM	A-3, A-1, A-2, A-4	0	0	90-100	85-100	40-70	5-40	0-30	NP-10
222B----------Typic Udipsamments	0-2	Sand----------	SP, SP-SM, SM	A-1, A-2, A-3	0	0	95-100	85-100	40-70	3-15	0-14	NP
	2-30	Sand----------	SP, SP-SM, SM	A-1, A-2, A-3	0	0	95-100	85-100	40-70	3-15	0-14	NP
	30-99	Sand, coarse sand.	SP, SP-SM, SM	A-1, A-2, A-3	0	0	95-100	85-100	40-70	0-15	0-14	NP
223B, 223C, 223D, 223E:												
Graycalm----	0-1	Sand----------	SM, SP-SM, SP	A-2, A-1, A-3	0	0-5	95-100	75-100	35-55	0-15	0-14	NP
	1-46	Sand, loamy sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0-5	95-100	75-100	30-75	0-30	0-14	NP
	46-70	Sand, loamy sand, loamy coarse sand.	SM, SP-SM, SP	A-2, A-1, A-3	0	0-5	95-100	75-100	30-75	0-30	0-14	NP
	70-99	Sand, coarse sand.	SP, SP-SM, SM	A-2, A-1, A-3	0	0-5	95-100	75-100	35-55	0-15	0-14	NP
Grayling----	0-2	Sand----------	SM, SP-SM, SP	A-1, A-2, A-3	0	0	95-100	90-100	45-70	3-15	0-14	NP
	2-29	Sand----------	SP, SP-SM, SM	A-1, A-2, A-3	0	0	95-100	90-100	45-70	3-15	0-14	NP
	29-99	Sand, coarse sand.	SP, SP-SM, SM	A-1, A-2, A-3	0	0	95-100	90-100	40-70	0-15	0-14	NP
224B----------Croswell	0-4	Sand----------	SP-SM, SM	A-3, A-2-4, A-1-b	0	0	90-100	75-100	40-70	5-15	0-14	NP
	4-20	Sand, loamy sand.	SP-SM, SM, SP	A-3, A-2-4, A-1-b	0	0	90-100	75-100	40-75	3-30	0-14	NP
	20-99	Sand----------	SP-SM, SM, SP	A-3, A-2-4, A-1-b	0	0	90-100	75-100	40-70	3-15	0-14	NP
225B, 225C----Entic Haplorthods	0-4	Sand----------	SP-SM, SM	A-2, A-1, A-3	0	0	95-100	90-100	45-70	5-15	0-14	NP
	4-30	Sand----------	SP, SP-SM, SM	A-2, A-1, A-3	0	0	95-100	90-100	45-70	3-15	0-14	NP
	30-55	Sand----------	SP, SP-SM, SM	A-2, A-1, A-3	0	0	95-100	90-100	45-70	0-15	0-14	NP
	55-80	Sandy clay loam, clay loam.	SC, CL	A-6, A-7, A-2-7	0	0	95-100	85-100	65-95	30-80	30-50	10-25

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
231D, 231E:												
Entic Haplorthods	0-4	Sand----------	SP, SP-SM, SM	A-2, A-3, A-1	0	0	95-100	85-100	45-70	1-15	0-14	NP
	4-60	Sand----------	SP, SP-SM, SM	A-2, A-3, A-1	0	0	95-100	85-100	45-70	1-15	0-14	NP
	60-85	Sand----------	SP, SP-SM, SM	A-2, A-3, A-1	0	0	95-100	85-100	45-70	1-15	0-14	NP
	85-99	Stratified sand to sandy loam.	SP, SM, SC-SM, SC	A-3, A-1, A-2, A-4	0	0	95-100	85-100	40-70	1-40	0-30	NP-10
Alfic Haplorthods	0-7	Sand----------	SP-SM, SM	A-2-4, A-3, A-1-b	0	0	90-100	85-100	40-70	5-15	0-14	NP
	7-37	Sand, loamy sand.	SP, SP-SM, SM	A-2-4, A-1-b, A-3	0	0	90-100	75-100	35-75	0-30	0-14	NP
	37-42	Sandy loam, fine sandy loam, sandy clay loam.	SC-SM, SC, CL-ML, CL	A-2-4, A-4, A-6	0	0	90-100	75-100	45-90	20-55	20-40	4-18
	42-99	Sand, loamy sand, coarse sand.	SP, SP-SM, SM	A-2-4, A-1-b, A-3	0	0	90-100	75-100	35-75	0-30	0-14	NP
232B:												
Entic Haplorthods	0-3	Sand----------	SP, SP-SM, SM	A-1, A-2, A-3	0	0	95-100	85-100	40-70	3-15	0-14	NP
	3-30	Sand----------	SP, SP-SM, SM	A-1, A-2, A-3	0	0	95-100	85-100	40-70	3-15	0-14	NP
	30-99	Sand, coarse sand.	SP, SP-SM, SM	A-1, A-2, A-3	0	0	95-100	85-100	40-70	0-15	0-14	NP
Alfic Haplorthods	0-7	Sand----------	SP-SM, SM, SP	A-2-4, A-1-b, A-3	0	0	95-100	75-100	35-75	0-15	0-14	NP
	7-37	Sand, loamy sand.	SP, SP-SM, SM	A-2-4, A-1-b, A-3	0	0	95-100	75-100	35-75	0-30	0-14	NP
	37-42	Sandy loam, fine sandy loam, sandy clay loam.	SC-SM, SC, CL-ML, CL	A-2-4, A-4, A-6	0	0	95-100	75-100	45-90	20-55	20-40	4-18
	42-99	Sand, loamy sand, coarse sand.	SP, SP-SM, SM	A-2-4, A-1-b, A-3	0	0	95-100	75-100	35-75	0-30	0-14	NP

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct	Pct					Pct	
233B, 233C, 233D:												
Alfic Haplorthods	0-7	Sand----------	SP-SM, SM	A-2-4, A-3, A-1-b	0	0	90-100	85-100	40-70	5-15	0-14	NP
	7-37	Sand, loamy sand.	SP, SP-SM, SM	A-2-4, A-1-b, A-3	0	0	90-100	75-100	35-75	0-30	0-14	NP
	37-42	Sandy loam, fine sandy loam, sandy clay loam.	SC-SM, SC, CL-ML, CL	A-2-4, A-4, A-6	0	0	90-100	75-100	45-90	20-55	20-40	4-18
	42-99	Sand, loamy sand, coarse sand.	SP, SP-SM, SM	A-2-4, A-1-b, A-3	0	0	90-100	75-100	35-75	0-30	0-14	NP
Entic Haplorthods	0-3	Sand----------	SP, SP-SM, SM	A-1, A-2, A-3	0	0	95-100	85-100	40-70	3-15	0-14	NP
	3-55	Sand----------	SP, SP-SM, SM	A-1, A-2, A-3	0	0	95-100	85-100	40-70	3-15	0-14	NP
	55-70	Sand, coarse sand.	SP, SP-SM, SM	A-1, A-2, A-3	0	0	95-100	85-100	40-70	0-15	0-14	NP
	70-95	Stratified sand to sandy clay loam.	SM, SC, CL, ML	A-3, A-2, A-4, A-6	0	0	95-100	85-100	40-90	5-55	0-40	NP-20
235B, 235C:												
Alfic Haplorthods, sandy over loamy-------	0-6	Sand----------	SP-SM, SM	A-2-4, A-3, A-1-b	0	0	90-100	85-100	40-70	5-15	0-14	NP
	6-27	Sand, loamy sand.	SP-SM, SM	A-2-4, A-3, A-1-b	0	0	90-100	85-100	40-75	5-30	0-14	NP
	27-44	Sand, loamy sand.	SP-SM, SM	A-2-4, A-3, A-1-b	0	0	90-100	85-100	40-75	5-30	0-14	NP
	44-52	Sandy clay loam, gravelly clay loam, silty clay loam.	SC, CL	A-6, A-7, A-2-6	0	0	85-100	70-100	60-95	30-90	30-50	11-25
	52-99	Sand, loamy fine sand, gravelly sandy loam.	SP, SM, SC-SM, SP-SM	A-2-4, A-3, A-4	0	0	85-100	70-100	40-90	0-40	0-25	NP-7

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 10 inches	Fragments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
235B, 235C: Alfic Haplorthods, sandy-------	0-7	Sand----------	SP-SM, SM	A-2-4, A-3, A-1-b	0	0	90-100	85-100	40-70	5-15	0-14	NP
	7-37	Sand, loamy sand.	SP, SP-SM, SM	A-2-4, A-1-b, A-3	0	0	90-100	75-100	35-75	0-30	0-14	NP
	37-42	Sandy loam, fine sandy loam, sandy clay loam.	SC-SM, SC, CL-ML, CL	A-2-4, A-4, A-6	0	0	90-100	75-100	45-90	20-55	20-40	4-18
	42-99	Sand, loamy sand, coarse sand.	SP, SP-SM, SM	A-2-4, A-1-b, A-3	0	0	90-100	75-100	35-75	0-30	0-14	NP
236B---------- Arenic Eutroboralfs	0-2	Loamy sand----	SP-SM, SM	A-2-4, A-1-b	0	0	90-100	75-100	35-75	10-30	---	NP
	2-4	Sand, loamy sand.	SP-SM, SM	A-2-4, A-3, A-1-b	0	0	90-100	75-100	35-75	5-30	---	NP
	4-32	Sand, loamy sand.	SP-SM, SM	A-2-4, A-3, A-1-b	0	0	90-100	75-100	35-75	5-30	---	NP
	32-47	Sandy loam, sandy clay loam, gravelly sandy loam.	SM, SC, SC-SM	A-2-4, A-4, A-6	0	0	90-100	70-100	40-85	20-50	15-30	NP-11
	47-80	Fine sand, coarse sand, gravelly loamy sand.	SP, SP-SM, SM	A-2-4, A-3, A-1-b	0	0	90-100	70-100	35-80	0-30	---	NP
237B, 237D---- Eutroboralfs	0-84	Variable------	---	---	---	---	---	---	---	---	---	---
254A: Borosaprists.												
Fluvaquents--	0-80	Variable------	---	---	---	---	---	---	---	---	---	---
Aquic Udipsamments	0-2	Sand----------	SP-SM, SM	A-1, A-2, A-3	0	0	95-100	85-100	40-70	5-15	0-14	NP
	2-45	Sand----------	SP-SM, SM	A-1, A-2, A-3	0	0	95-100	85-100	40-70	5-15	0-14	NP
	45-80	Sand----------	SP-SM, SM	A-1, A-2, A-3	0	0	95-100	85-100	40-70	5-15	0-14	NP
262A---------- Au Gres	0-10	Sand----------	SM, SP-SM, SP	A-2-4, A-3, A-1-b	0	0	95-100	75-100	35-70	0-15	0-14	NP
	10-33	Sand, loamy sand.	SP-SM, SM, SC-SM, SP	A-2-4, A-3, A-1-b	0	0	95-100	75-100	35-75	0-30	0-25	NP-7
	33-80	Sand----------	SP-SM, SM, SP	A-3, A-2-4, A-1-b	0	0	95-100	75-100	35-70	0-15	0-14	NP

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 10 inches	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
263A---------- Argic Endoaquods	0-80	Variable------	---	---	---	---	---	---	---	---	---	---
264A---------- Allendale	0-13	Loamy sand----	SM, SP-SM	A-2-4, A-1-b, A-4	0	0	95-100	90-100	45-80	10-40	0-14	NP
	13-25	Sand, loamy sand, loamy fine sand.	SM, SP-SM	A-2-4, A-3, A-4, A-1-b	0	0	95-100	90-100	45-80	5-40	0-14	NP
	25-80	Silty clay, clay.	CH, MH	A-7	0	0	100	90-100	90-100	75-95	50-70	20-40
265B:												
Eutroboralfs	0-96	Variable------	---	---	---	---	---	---	---	---	---	---
Allendale----	0-13	Loamy sand----	SM, SP-SM	A-2-4, A-1-b, A-4	0	0	95-100	90-100	45-80	10-40	0-14	NP
	13-25	Sand, loamy sand, loamy fine sand.	SM, SP-SM	A-2-4, A-3, A-4, A-1-b	0	0	95-100	90-100	45-80	5-40	0-14	NP
	25-60	Silty clay, clay.	CH, MH	A-7	0	0	100	90-100	90-100	75-95	50-70	20-40
266A---------- Typic Duraquods	0-10	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
	10-27	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
	27-60	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
272: Endoaquods.												
Fluvaquents--	0-80	Variable------	---	---	---	---	---	---	---	---	---	---
273:												
Leafriver----	0-10	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	10-14	Loamy sand, fine sandy loam, fine sand.	SM	A-4, A-2-4	0	0	100	95-100	55-80	15-50	15-20	NP-4
	14-80	Loamy sand, fine sand, sand.	SM, SP-SM, SP	A-3, A-2, A-2-4, A-1	0	0	95-100	80-100	45-70	3-35	---	NP
Wakeley------	0-6	Mucky sand----	SP, SP-SM, SM	A-2-4, A-3, A-1-b	0	0	95-100	75-100	35-70	0-15	---	NP
	6-29	Sand, loamy sand, loamy fine sand.	SP, SP-SM, SM, SC-SM	A-2-4, A-3, A-4	0	0-5	95-100	75-100	35-95	0-50	<25	NP-7
	29-60	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	0	95-100	90-100	85-100	75-95	40-65	20-40

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct	Pct					Pct	
274----------- Typic Endoaquods	0-4	Muck, mucky sand.	PT, SP, SM, SP-SM	A-2-4, A-3, A-8, A-1-b	0	0	95-100	75-100	35-70	0-15	---	NP
	4-17	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
	17-80	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
280:												
Aquents------	0-80	Variable------	---	---	---	---	---	---	---	---	---	---
Histosols----	0-51	Muck----------	PT	A-8	0	0	---	---	---	---	---	NP
	51-80	Variable------	---	---	---	---	---	---	---	---	---	---
281----------- Borosaprists	0-25	Mucky peat----	PT	A-8	---	---	---	---	---	---	---	---
	25-80	Variable------	---	---	---	---	---	---	---	---	---	---
282----------- Borosaprists	0-38	Muck----------	PT	A-8	---	---	---	---	---	---	---	---
	38-80	Variable------	---	---	---	---	---	---	---	---	---	---
343----------- Sims	0-5	Loam----------	CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	70-95	50-75	25-40	5-15
	5-47	Clay loam, silty clay loam, clay.	CL, CH	A-7	0	0-5	90-100	85-100	75-95	55-90	40-55	20-30
	47-80	Clay loam, silty clay loam.	CL	A-7	0	0-5	90-100	85-100	75-95	55-90	40-50	20-25
355E:												
Crowell------	0-8	Sand----------	SM, SP-SM	A-1, A-2-4, A-3	0	0	90-100	90-100	35-80	5-15	0-14	NP
	8-17	Sand----------	SM, SP-SM	A-1, A-2-4, A-3	0	0	90-100	90-100	35-80	5-15	0-14	NP
	17-34	Sand----------	SM, SP-SM	A-1, A-2-4, A-3	0	0	90-100	90-100	35-80	5-15	0-14	NP
	34-80	Sand----------	SM, SP-SM	A-1, A-2-4, A-3	0	0	90-100	90-100	35-80	5-15	0-14	NP
Proper-------	0-3	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
	3-10	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
	10-24	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
	24-38	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
	38-80	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
356E:												
Aquepts------	0-80	Variable------	---	---	---	---	---	---	---	---	---	---
Histosols----	0-25	Muck----------	PT	A-8	0	0	---	---	---	---	---	NP
	25-80	Variable------	---	---	---	---	---	---	---	---	---	---
Fluvaquents--	0-80	Variable------	---	---	---	---	---	---	---	---	---	---

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
357B:												
Udipsamments	0-80	Sand----------	SP, SP-SM, SM	A-1, A-2, A-3	0	0	85-100	75-100	30-75	0-25	0-14	NP
Urban land.												
360----------- Wakeley	0-5	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	5-27	Sand, loamy sand, loamy fine sand.	SP, SP-SM, SM, SC-SM	A-2-4, A-3, A-4	0	0-5	95-100	75-100	35-95	0-50	<25	NP-7
	27-80	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	0	95-100	90-100	85-100	75-95	40-65	20-40
367A:												
Whittemore---	0-12	Sand----------	SM, SP-SM	A-1, A-2, A-3	0	0	95-100	95-100	50-70	5-15	---	NP
	12-17	Sand----------	SM, SP-SM	A-1, A-2, A-3	0	0	95-100	95-100	50-70	5-15	---	NP
	17-35	Sand, loamy sand.	SM, SP-SM	A-2, A-3	0	0	95-100	95-100	50-75	10-20	---	NP
	35-44	Silty clay, clay.	CL, CH	A-7	0	0	95-100	95-100	90-100	90-95	40-70	25-40
	44-80	Silty clay----	CL, CH	A-7	0	0	95-100	95-100	90-100	90-95	40-70	25-40
Springport---	0-10	Silty clay loam.	CL, CH	A-7	0	0-2	95-100	95-100	85-100	80-95	40-65	20-40
	10-36	Silty clay, clay.	CL, CH	A-7	0	0-2	95-100	95-100	85-100	80-95	40-65	20-40
	36-50	Silty clay, silty clay loam, clay.	CL, CH	A-7	0	0-2	95-100	95-100	85-100	80-95	40-65	20-40
	50-80	Silty clay, silty clay loam.	CL, CH	A-7	0	0-2	95-100	95-100	85-100	80-95	40-65	20-40
368A:												
Au Gres------	0-9	Sand----------	SM, SP-SM, SP	A-2-4, A-3, A-1-b	0	0	95-100	75-100	35-70	0-15	0-14	NP
	9-29	Sand, loamy sand.	SP-SM, SM, SC-SM, SP	A-2-4, A-3, A-1-b	0	0	95-100	75-100	35-75	0-30	0-25	NP-7
	29-80	Sand----------	SP-SM, SM, SP	A-3, A-2-4, A-1-b	0	0	95-100	75-100	35-70	0-15	0-14	NP
Deford-------	0-5	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	5-80	Fine sand, very fine sand, sand.	SM, SP-SM, SP	A-2-4, A-3	0	0	100	100	50-80	0-35	15-20	NP-4
369----------- Deford	0-5	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	5-80	Fine sand, very fine sand, sand.	SM, SP-SM, SP	A-2-4, A-3	0	0	100	100	50-80	0-35	15-20	NP-4

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct	Pct					Pct	
370A----------- McIvor	0-2	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
	2-18	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
	18-24	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
	24-56	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
	56-80	Silty clay----	CH	A-7	0	0	100	100	95-100	90-95	50-65	25-40
371----------- Springport	0-11	Silt loam-----	CL	A-4, A-6	0	0-2	95-100	95-100	80-100	70-90	25-40	7-15
	11-23	Silty clay, clay.	CL, CH	A-7	0	0-2	95-100	95-100	85-100	80-95	40-65	20-40
	23-27	Silty clay, silty clay loam, clay.	CL, CH	A-7	0	0-2	95-100	95-100	85-100	80-95	40-65	20-40
	27-80	Silty clay, silty clay loam.	CL, CH	A-7	0	0-2	95-100	95-100	85-100	80-95	40-65	20-40
372B:												
Proper--------	0-3	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
	3-10	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
	10-24	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
	24-38	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
	38-80	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
Leafriver-----	0-10	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	10-14	Loamy sand, fine sandy loam, fine sand.	SM	A-4, A-2-4	0	0	100	95-100	55-80	15-50	15-20	NP-4
	14-80	Loamy sand, fine sand, sand.	SM, SP-SM, SP	A-3, A-2, A-2-4, A-1	0	0	95-100	80-100	45-70	3-35	---	NP
375----------- Kanotin	0-9	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	9-12	Sand----------	SM, SP-SM	A-3, A-2-4	0	0	100	95-100	50-70	5-15	---	NP
	12-51	Sand----------	ML, SM	A-4	0	0	100	95-100	75-100	35-90	20-40	NP-10
	51-58	Stratified very fine sand to silt loam.	CH, CL	A-7	0	0	100	95-100	80-100	80-100	40-65	20-40
	58-80	Silty clay----	CL, CH	A-7	0	0	100	100	80-100	80-100	48-66	25-39
377----------- Wabun	0-6	Mucky sand----	SP, SP-SM, SM	A-1, A-2-4, A-3	0	0	100	95-100	50-70	5-15	---	NP
	6-48	Sand, fine sand.	SP, SP-SM, SM	A-3, A-2-4, A-1	0	0	100	95-100	50-70	5-15	---	NP
	48-58	Stratified sand to fine sand.	SP, SP-SM, SM	A-3, A-2-4, A-1	0	0	100	95-100	50-80	5-15	---	NP
	58-80	Silty clay, clay.	CL, CH	A-7	0	0	100	95-100	95-100	90-95	40-70	25-40

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
378A----------Algonquin	0-9	Clay----------	CL, MH, CL	A-7	0	0	100	90-100	90-100	75-95	45-70	20-40
	9-13	Clay----------	CL, MH, CH	A-7	0	0	100	95-100	95-100	90-95	45-75	20-40
	13-17	Silty clay----	CL, MH, CH	A-7	0	0	100	95-100	95-100	90-95	45-70	20-40
	17-80	Silty clay----	CL, MH, CH	A-7	0	0	100	95-100	95-100	90-95	45-70	20-40
379A:												
Algonquin----	0-9	Clay----------	CL, MH, CL	A-7	0	0	100	90-100	90-100	75-95	45-70	20-40
	9-13	Clay----------	CL, MH, CH	A-7	0	0	100	95-100	95-100	90-95	45-75	20-40
	13-17	Silty clay----	CL, MH, CH	A-7	0	0	100	95-100	95-100	90-95	45-70	20-40
	17-80	Silty clay----	CL, MH, CH	A-7	0	0	100	95-100	95-100	90-95	45-70	20-40
Springport---	0-11	Silt loam-----	CL	A-4, A-6	0	0-2	95-100	95-100	80-100	70-90	25-40	7-15
	11-23	Silty clay, clay.	CL, CH	A-7	0	0-2	95-100	95-100	85-100	80-95	40-65	20-40
	23-27	Silty clay, silty clay loam, clay.	CL, CH	A-7	0	0-2	95-100	95-100	85-100	80-95	40-65	20-40
	27-80	Silty clay, silty clay loam.	CL, CH	A-7	0	0-2	95-100	95-100	85-100	80-95	40-65	20-40
380. Access denied												
381A:												
McIvor-------	0-2	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
	2-18	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
	18-24	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
	24-56	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
	56-80	Silty clay----	CH	A-7	0	0	100	100	95-100	90-95	50-65	25-40
Wakeley------	0-5	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	5-27	Sand, loamy sand, loamy fine sand.	SP, SP-SM, SM, SC-SM	A-2-4, A-3, A-4	0	0-5	95-100	75-100	35-95	0-50	<25	NP-7
	27-80	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	0	95-100	90-100	85-100	75-95	40-65	20-40
382B----------Proper	0-3	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
	3-10	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
	10-24	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
	24-38	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
	38-80	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
383B----------Wurtsmith	0-4	Sand----------	SP-SM, SM, SP	A-1, A-2, A-3	0	0	95-100	90-100	45-70	3-15	0-14	NP
	4-24	Sand----------	SP-SM, SM, SP	A-1, A-2, A-3	0	0	95-100	90-100	45-70	3-15	0-14	NP
	24-80	Sand----------	SP-SM, SM, SP	A-1, A-2, A-3	0	0	95-100	90-100	45-70	3-15	0-14	NP

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct	Pct					Pct	
392----------- Caffey	0-8	Mucky sand----	SP-SM, SM	A-3, A-2-4	0	0	95-100	95-100	50-70	5-15	0-14	NP
	8-37	Sand, loamy sand, fine sand.	SP-SM, SM	A-3, A-2-4, A-4	0	0	95-100	95-100	50-90	5-45	0-14	NP
	37-80	Stratified very fine sandy loam to loamy very fine sand.	SC, CL-ML, CL	A-4, A-6	0	0	95-100	95-100	65-95	40-90	20-40	4-20
403B, 403C---- Iargo	0-8	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	90-100	80-90	26-34	7-15
	8-12	Silty clay, silty clay loam, clay.	CL, CH	A-7	0	0	100	100	90-100	80-90	40-65	20-35
	12-19	Silty clay, silty clay loam.	CL, CH	A-7	0	0	100	100	90-100	80-90	40-65	20-35
	19-80	Stratified very fine sand to silty clay loam.	CL, CL-ML	A-4, A-6	0	0	100	100	90-100	40-90	20-52	4-28
404A---------- Manary	0-11	Silty clay loam.	CL	A-7	0	0	100	90-100	90-100	85-95	35-50	15-25
	11-18	Silty clay, silty clay loam.	CL, CH	A-7	0	0	100	90-100	90-100	85-95	40-65	20-40
	18-29	Silty clay----	CL, CH	A-7	0	0	100	90-100	90-100	90-95	45-65	20-40
	29-80	Stratified fine sand to silty clay.	SM, CL	A-4, A-7	0	0	100	90-100	65-95	20-95	20-50	4-25
405B:												
Manary-------	0-11	Silty clay loam.	CL	A-7	0	0	100	90-100	90-100	85-95	35-50	15-25
	11-18	Silty clay, silty clay loam.	CL, CH	A-7	0	0	100	90-100	90-100	85-95	40-65	20-40
	18-29	Silty clay----	CL, CH	A-7	0	0	100	90-100	90-100	90-95	45-65	20-40
	29-80	Stratified fine sand to silty clay.	SM, CL	A-4, A-7	0	0	100	90-100	65-95	20-95	20-50	4-25
Iargo--------	0-8	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	90-100	80-90	26-34	7-15
	8-12	Silty clay, silty clay loam, clay.	CL, CH	A-7	0	0	100	100	90-100	80-90	40-65	20-35
	12-19	Silty clay, silty clay loam.	CL, CH	A-7	0	0	100	100	90-100	80-90	40-65	20-35
	19-80	Stratified very fine sand to silty clay loam.	CL, CL-ML	A-4, A-6	0	0	100	100	90-100	40-90	20-52	4-28
406A---------- Winterfield	0-8	Loamy sand----	SM, SC-SM	A-2-4	0	0	100	100	50-90	15-30	10-20	NP-5
	8-18	Loamy sand----	SM, SC-SM	A-2-4	0	0	100	100	50-90	15-30	10-20	NP-5
	18-80	Sand----------	SP, SP-SM, SM	A-2-4, A-3	0	0	100	100	50-90	0-30	0-14	NP

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 10 inches	Fragments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
407----------- Lacota	0-10	Loam----------	CL-ML, CL	A-4, A-6	0	0	100	100	90-100	50-90	25-35	5-15
	10-28	Loam, clay loam, silty clay loam.	CL	A-7, A-4	0	0	100	100	50-100	50-95	28-50	10-25
	28-80	Sand----------	SM, SP-SM, SC-SM	A-3, A-2, A-1	0	0-5	95-100	90-100	50-70	5-15	0-20	NP-4
408----------- Sims	0-5	Loam----------	CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	70-95	50-75	25-40	5-15
	5-47	Clay loam, silty clay loam, clay.	CL, CH	A-7	0	0-5	90-100	85-100	75-95	55-90	40-55	20-30
	47-80	Clay loam, silty clay loam.	CL	A-7	0	0-5	90-100	85-100	75-95	55-90	40-50	20-25
409A:												
Finch--------	0-3	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	---	NP
	3-12	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	---	NP
	12-21	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	---	NP
	21-80	Sand, fine sand, loamy sand.	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	---	NP
Deford-------	0-5	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	5-80	Fine sand, very fine sand, sand.	SM, SP-SM, SP	A-2-4, A-3	0	0	100	100	50-80	0-35	15-20	NP-4
Au Gres------	0-9	Sand----------	SM, SP-SM, SP	A-2-4, A-3, A-1-b	0	0	95-100	75-100	35-70	0-15	0-14	NP
	9-29	Sand, loamy sand.	SP-SM, SM, SC-SM, SP	A-2-4, A-3, A-1-b	0	0	95-100	75-100	35-75	0-30	0-25	NP-7
	29-80	Sand----------	SP-SM, SM, SP	A-3, A-2-4, A-1-b	0	0	95-100	75-100	35-70	0-15	0-14	NP
410B:												
Proper-------	0-3	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
	3-10	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
	10-24	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
	24-38	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
	38-80	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	0-14	NP
Finch--------	0-2	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	---	NP
	2-12	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	---	NP
	12-31	Sand----------	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	---	NP
	31-60	Sand, fine sand, loamy sand.	SP-SM, SM	A-3, A-2-4	0	0	100	100	50-70	5-15	---	NP

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
410B:												
Deford-------	0-5	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	5-80	Fine sand, very fine sand, sand.	SM, SP-SM, SP	A-2-4, A-3	0	0	100	100	50-80	0-35	15-20	NP-4
411A---------- Meehan	0-2	Sand----------	SM, SP-SM	A-1, A-3, A-2	0	0	90-100	75-100	40-90	5-15	---	NP
	2-45	Sand, loamy sand, loamy coarse sand.	SM, SP-SM, SP	A-1, A-2, A-3	0	0	90-100	75-100	40-90	3-30	---	NP
	45-80	Sand, coarse sand.	SP, SP-SM	A-1, A-3, A-2	0	0	90-100	75-100	40-90	0-5	---	NP
425D---------- Hottis	0-5	Sandy loam----	SM, SC-SM, CL-ML	A-4, A-2	0	0-4	95-100	85-100	55-85	25-55	10-30	NP-10
	5-13	Sandy loam, loam.	CL-ML, SC-SM, SC, CL	A-2, A-4	0	0-4	95-100	75-100	45-95	20-75	15-30	NP-10
	13-33	Clay----------	CH, SC	A-7	0	0-4	95-100	85-100	65-95	45-80	50-70	25-40
	33-80	Clay, silty clay.	CH, SC	A-7	0	0-4	95-100	85-100	65-95	45-80	50-70	25-40
426B, 426C---- Coppler	0-5	Loamy sand----	SM, SP-SM	A-2, A-1-b	0	0-15	85-100	85-95	40-70	10-30	0-14	NP
	5-24	Loamy sand, sand, gravelly sand.	SM, SP-SM	A-2, A-3, A-1-b	0	0-15	65-100	60-95	30-70	5-30	0-14	NP
	24-29	Very gravelly sandy loam, very gravelly sandy clay loam, very gravelly loam.	GM-GC, GC, GP-GC	A-4, A-6, A-2	0	0-15	35-55	30-50	10-45	5-45	20-35	4-15
	29-80	Gravelly sand, very gravelly sand, extremely gravelly coarse sand.	GP, GM, GP-GM	A-1	0	0-15	30-55	20-50	5-45	0-25	0-14	NP
427----------- Tonkey	0-7	Sandy loam----	SM, SC, SC-SM	A-2, A-4	0	0	100	100	60-70	30-40	0-28	NP-9
	7-12	Sandy loam, loamy sand.	SM, SC-SM, SC	A-2, A-4	0	0	100	100	50-75	15-40	0-25	NP-9
	12-17	Loam, sandy clay loam, sandy loam.	CL-ML, SC, CL, SC-SM	A-4, A-6, A-2	0	0-2	95-100	85-100	50-90	30-75	20-35	5-14
	17-80	Stratified sand to loam.	SM, SC-SM, SP-SM, ML	A-2, A-1, A-3, A-4	0	0-2	95-100	85-100	40-80	5-65	0-30	NP-11

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct	Pct					Pct	
429D---------- Menominee	0-7	Sand----------	SM, SP-SM	A-2-4, A-3	0	0-10	95-100	95-100	50-80	5-30	---	NP
	7-23	Sand, loamy sand, gravelly loamy sand.	SP, SM, SP-SM	A-2-4, A-3, A-1-b	0	0-10	90-100	85-100	40-75	0-15	---	NP
	23-59	Clay loam, loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	0-10	85-95	85-95	80-95	60-90	25-40	5-20
	59-80	Loam, clay loam, silty clay loam.	CL, CL-ML, SC, SC-SM	A-4, A-6, A-1, A-2	0	0-10	95-100	85-95	45-95	20-80	25-40	5-20
430D, 430E---- Mongo	0-5	Loam----------	CL, CL-ML	A-4, A-6	0	0	100	100	85-95	60-75	20-40	5-15
	5-12	Silty clay, silty clay loam.	CL, CH	A-7	0	0	100	100	95-100	85-95	40-65	20-40
	12-21	Silty clay, silty clay loam.	CL, CH	A-7	0	0	100	100	95-100	85-95	40-65	20-40
	21-80	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	95-100	85-95	40-65	20-40
431B---------- Skeel	0-8	Loamy sand----	SP-SM, SM	A-2-4, A-1-b	0	0	90-100	90-100	45-70	10-25	0-14	NP
	8-11	Sand, loamy sand.	SM, SP-SM	A-2, A-3	0	0	90-100	90-100	50-70	0-30	0-14	NP
	11-29	Sand----------	SM, SP-SM	A-2, A-3	0	0	90-100	90-100	50-70	0-30	0-14	NP
	29-36	Sand----------	SM, SP-SM	A-2, A-3	0	0	90-100	90-100	50-70	0-30	0-14	NP
	36-39	Clay loam, silty clay loam.	CL	A-6, A-7	0	0	90-100	90-100	85-95	65-85	35-50	15-25
	39-80	Clay loam, silty clay loam.	CL	A-7	0	0	90-100	90-100	80-95	65-85	35-50	15-25
432B:												
Wurtsmith----	0-4	Sand----------	SP-SM, SM, SP	A-1, A-2, A-3	0	0	95-100	90-100	45-70	3-15	0-14	NP
	4-24	Sand----------	SP-SM, SM, SP	A-1, A-2, A-3	0	0	95-100	90-100	45-70	3-15	0-14	NP
	24-80	Sand----------	SP-SM, SM, SP	A-1, A-2, A-3	0	0	95-100	90-100	45-70	3-15	0-14	NP
Meehan-------	0-2	Sand----------	SM, SP-SM	A-1, A-3, A-2	0	0	90-100	75-100	40-90	5-15	---	NP
	2-43	Sand, loamy sand, loamy coarse sand.	SM, SP-SM, SP	A-1, A-2, A-3	0	0	90-100	75-100	40-90	3-30	---	NP
	43-80	Sand, coarse sand.	SP, SP-SM	A-1, A-3, A-2	0	0	90-100	75-100	40-90	0-5	---	NP
433B:												
Morganlake---	0-4	Sand----------	SM, SP-SM	A-3	0	0	95-100	90-100	50-70	5-15	0-14	NP
	4-23	Sand----------	SP-SM, SM	A-3	0	0	95-100	90-100	50-70	5-15	0-14	NP
	23-29	Loamy sand----	SP-SM, SM	A-3	0	0	95-100	90-100	50-75	5-30	0-14	NP
	29-47	Clay loam-----	CL	A-6, A-7	0	0	80-100	75-95	65-95	55-75	25-45	10-20
	47-80	Clay loam, silty clay loam.	CL	A-6, A-7	0	0	80-100	75-95	65-95	55-75	25-45	10-20

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
433B:												
Graycalm-----	0-4	Sand----------	SM, SP-SM, SP	A-2, A-1, A-3	0	0-5	95-100	75-100	35-55	0-15	0-14	NP
	4-45	Sand, loamy sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0-5	95-100	75-100	30-75	0-30	0-14	NP
	45-80	Sand, loamy sand, loamy coarse sand.	SM, SP-SM, SP	A-2, A-1, A-3	0	0-5	95-100	75-100	30-75	0-30	0-14	NP
434D:												
Graycalm-----	0-4	Sand----------	SM, SP-SM, SP	A-2, A-1, A-3	0	0-5	95-100	75-100	35-55	0-15	0-14	NP
	4-45	Sand, loamy sand.	SP-SM, SM, SP	A-3, A-2, A-1	0	0-5	95-100	75-100	30-75	0-30	0-14	NP
	45-80	Sand, loamy sand, loamy coarse sand.	SM, SP-SM, SP	A-2, A-1, A-3	0	0-5	95-100	75-100	30-75	0-30	0-14	NP
Menominee----	0-7	Sand----------	SM, SP-SM	A-2-4, A-3	0	0-10	95-100	95-100	50-80	5-30	---	NP
	7-23	Sand, loamy sand, gravelly loamy sand.	SP, SM, SP-SM	A-2-4, A-3, A-1-b	0	0-10	90-100	85-100	40-75	0-15	---	NP
	23-59	Clay loam, loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	0-10	85-95	85-95	80-95	60-90	25-40	5-20
	59-80	Loam, clay loam, silty clay loam.	CL, CL-ML, SC, SC-SM	A-4, A-6, A-1, A-2	0	0-10	95-100	85-95	45-95	20-80	25-40	5-20
Morganlake---	0-4	Sand----------	SM, SP-SM	A-3	0	0	95-100	90-100	50-70	5-15	0-14	NP
	4-23	Sand----------	SP-SM, SM	A-3	0	0	95-100	90-100	50-70	5-15	0-14	NP
	23-29	Loamy sand----	SP-SM, SM	A-3	0	0	95-100	90-100	50-75	5-30	0-14	NP
	29-47	Clay loam-----	CL	A-6, A-7	0	0	80-100	75-95	65-95	55-75	25-45	10-20
	47-80	Clay loam, silty clay loam.	CL	A-6, A-7	0	0	80-100	75-95	65-95	55-75	25-45	10-20
435B:												
Skeel--------	0-8	Loamy sand----	SP-SM, SM	A-2-4, A-1-b	0	0	90-100	90-100	45-70	10-25	0-14	NP
	8-11	Sand, loamy sand.	SM, SP-SM	A-2, A-3	0	0	90-100	90-100	50-70	0-30	0-14	NP
	11-29	Sand----------	SM, SP-SM	A-2, A-3	0	0	90-100	90-100	50-70	0-30	0-14	NP
	29-36	Sand----------	SM, SP-SM	A-2, A-3	0	0	90-100	90-100	50-70	0-30	0-14	NP
	36-39	Clay loam, silty clay loam.	CL	A-6, A-7	0	0	90-100	90-100	85-95	65-85	35-50	15-25
	39-80	Clay loam, silty clay loam.	CL	A-7	0	0	90-100	90-100	80-95	65-85	35-50	15-25
Algonquin----	0-9	Clay----------	CL, MH, CL	A-7	0	0	100	90-100	90-100	75-95	45-70	20-40
	9-13	Clay----------	CL, MH, CH	A-7	0	0	100	95-100	95-100	90-95	45-75	20-40
	13-17	Clay----------	CL, MH, CH	A-7	0	0	100	95-100	95-100	90-95	45-70	20-40
	17-80	Clay----------	CL, MH, CH	A-7	0	0	100	95-100	95-100	90-95	45-70	20-40
Aquepts------	0-80	Variable------	---	---	---	---	---	---	---	---	---	---

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification Unified	Classification AASHTO	Fragments > 10 inches	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
436A:												
Manary-------	0-11	Silty clay loam.	CL	A-7	0	0	100	90-100	90-100	85-95	35-50	15-25
	11-18	Silty clay, silty clay loam.	CL, CH	A-7	0	0	100	90-100	90-100	85-95	40-65	20-40
	18-29	Silty clay----	CL, CH	A-7	0	0	100	90-100	90-100	90-95	45-65	20-40
	29-80	Stratified fine sand to silty clay.	SM, CL	A-4, A-7	0	0	100	90-100	65-95	20-95	20-50	4-25
Whittemore---	0-12	Sand----------	SM, SP-SM	A-1, A-2, A-3	0	0	95-100	95-100	50-70	5-15	---	NP
	12-17	Sand----------	SM, SP-SM	A-1, A-2, A-3	0	0	95-100	95-100	50-70	5-15	---	NP
	17-35	Sand, loamy sand.	SM, SP-SM	A-2, A-3	0	0	95-100	95-100	50-75	10-20	---	NP
	35-44	Silty clay, clay.	CL, CH	A-7	0	0	95-100	95-100	90-100	90-95	40-70	25-40
	44-80	Silty clay----	CL, CH	A-7	0	0	95-100	95-100	90-100	90-95	40-70	25-40
Springport---	0-10	Silty clay loam.	CL, CH	A-7	0	0-2	95-100	95-100	85-100	80-95	40-65	20-40
	10-36	Silty clay, clay.	CL, CH	A-7	0	0-2	95-100	95-100	85-100	80-95	40-65	20-40
	36-50	Silty clay, silty clay loam, clay.	CL, CH	A-7	0	0-2	95-100	95-100	85-100	80-95	40-65	20-40
	50-80	Silty clay, silty clay loam.	CL, CH	A-7	0	0-2	95-100	95-100	85-100	80-95	40-65	20-40
437D:												
Wurtsmith----	0-4	Sand----------	SP-SM, SM, SP	A-1, A-2, A-3	0	0	95-100	90-100	45-70	3-15	0-14	NP
	4-24	Sand----------	SP-SM, SM, SP	A-1, A-2, A-3	0	0	95-100	90-100	45-70	3-15	0-14	NP
	24-80	Sand----------	SP-SM, SM, SP	A-1, A-2, A-3	0	0	95-100	90-100	45-70	3-15	0-14	NP
Meehan-------	0-2	Sand----------	SM, SP-SM	A-1, A-3, A-2	0	0	90-100	75-100	40-90	5-15	---	NP
	2-43	Sand, loamy sand, loamy coarse sand.	SM, SP-SM, SP	A-1, A-2, A-3	0	0	90-100	75-100	40-90	3-30	---	NP
	43-80	Sand, coarse sand.	SP, SP-SM	A-1, A-3, A-2	0	0	90-100	75-100	40-90	0-5	---	NP
Deer Park----	0-6	Sand----------	SP-SM, SM	A-2, A-3	0	0	100	100	50-70	5-15	0-14	NP
	6-18	Fine sand, sand.	SM, SP-SM	A-2, A-3	0	0	100	100	50-80	5-30	0-14	NP
	18-80	Fine sand, sand.	SP-SM, SM	A-2, A-3	0	0	100	100	50-80	5-30	0-14	NP

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification Unified	Classification AASHTO	Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct	Pct					Pct	
438C:												
Meehan-------	0-2	Sand----------	SM, SP-SM	A-1, A-3, A-2	0	0	90-100	75-100	40-90	5-15	---	NP
	2-43	Sand, loamy sand, loamy coarse sand.	SM, SP-SM, SP	A-1, A-2, A-3	0	0	90-100	75-100	40-90	3-30	---	NP
	43-80	Sand, coarse sand.	SP, SP-SM	A-1, A-3, A-2	0	0	90-100	75-100	40-90	0-5	---	NP
Tawas--------	0-24	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	24-80	Sand, loamy fine sand, gravelly sand.	SP, SM, SP-SM	A-3, A-2-4, A-4, A-1-b	0	0	80-100	60-100	30-80	0-40	0-14	NP
Wurtsmith----	0-4	Sand----------	SP-SM, SM, SP	A-1, A-2, A-3	0	0	95-100	90-100	45-70	3-15	0-14	NP
	4-24	Sand----------	SP-SM, SM, SP	A-1, A-2, A-3	0	0	95-100	90-100	45-70	3-15	0-14	NP
	24-80	Sand----------	SP-SM, SM, SP	A-1, A-2, A-3	0	0	95-100	90-100	45-70	3-15	0-14	NP
439D---------- Deer Park	0-6	Sand----------	SP-SM, SM	A-2, A-3	0	0	100	100	50-70	5-15	0-14	NP
	6-18	Fine sand, sand.	SM, SP-SM	A-2, A-3	0	0	100	100	50-80	5-30	0-14	NP
	18-80	Fine sand, sand.	SP-SM, SM	A-2, A-3	0	0	100	100	50-80	5-30	0-14	NP
440B:												
Kawkawlin----	0-6	Loam----------	ML, CL, CL-ML	A-4, A-6	0	0-5	95-100	85-100	70-95	50-75	20-40	2-15
	6-18	Clay loam, silty clay loam, clay.	CL, CH	A-7	0	0-5	95-100	85-100	75-100	55-95	40-55	20-30
	18-80	Clay loam, silty clay loam.	CL	A-6, A-7	0	0-5	95-100	85-100	75-100	50-95	35-50	15-25
Sims---------	0-5	Loam----------	CL, CL-ML	A-4, A-6	0	0-5	90-100	85-100	70-95	50-75	25-40	5-15
	5-47	Clay loam, silty clay loam, clay.	CL, CH	A-7	0	0-5	90-100	85-100	75-95	55-90	40-55	20-30
	47-80	Clay loam, silty clay loam.	CL	A-7	0	0-5	90-100	85-100	75-95	55-90	40-50	20-25
441B, 441C:												
Morganlake---	0-4	Sand----------	SM, SP-SM	A-3	0	0	95-100	90-100	50-70	5-15	0-14	NP
	4-23	Sand----------	SP-SM, SM	A-3	0	0	95-100	90-100	50-70	5-15	0-14	NP
	23-29	Loamy sand----	SP-SM, SM	A-3	0	0	95-100	90-100	50-75	5-30	0-14	NP
	29-47	Clay loam-----	CL	A-6, A-7	0	0	80-100	75-95	65-95	55-75	25-45	10-20
	47-80	Clay loam, silty clay loam.	CL	A-6, A-7	0	0	80-100	75-95	65-95	55-75	25-45	10-20

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
441B, 441C:												
Nester-------	0-11	Sandy loam----	SM, SC, SC, ML	A-2-4, A-4, A-1-b	0	0-5	90-95	75-95	45-85	20-55	0-30	NP-10
	11-17	Silt loam, loam, sandy loam.	ML, CL, SC, SM	A-4, A-6, A-2-4	0	0-5	90-95	75-95	45-95	20-90	0-35	NP-15
	17-34	Clay loam, silty clay loam, clay.	CL, CH	A-7	0	0-5	90-95	75-95	75-95	55-90	40-55	20-30
	34-80	Clay loam, silty clay loam.	CL	A-7	0	0-5	90-95	75-95	70-95	50-90	40-50	15-25
442D:												
Menominee----	0-7	Sand----------	SM, SP-SM	A-2-4, A-3	0	0-10	95-100	95-100	50-80	5-30	---	NP
	7-23	Sand, loamy sand, gravelly loamy sand.	SP, SM, SP-SM	A-2-4, A-3, A-1-b	0	0-10	90-100	85-100	40-75	0-15	---	NP
	23-59	Clay loam, loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	0-10	85-95	85-95	80-95	60-90	25-40	5-20
	59-80	Loam, clay loam, silty clay loam.	CL, CL-ML, SC, SC-SM	A-4, A-6, A-1, A-2	0	0-10	95-100	85-95	45-95	20-80	25-40	5-20
Curtisville--	0-5	Sandy loam----	SC-SM, SC	A-2, A-4	0	0-5	90-100	75-100	45-75	20-40	21-30	4-11
	5-16	Sandy loam, clay loam, loam.	CL, SC	A-2, A-4, A-6	0	0-5	90-100	75-100	45-100	20-90	25-39	7-18
	16-29	Clay, clay loam, silty clay loam.	CL, CH	A-7	0	0-5	90-100	75-100	75-100	55-95	44-53	21-28
	29-80	Clay loam, silty clay loam.	CL	A-7	0	0-5	90-100	75-100	75-100	50-95	39-48	18-25
442E:												
Menominee----	0-7	Sand----------	SM, SP-SM	A-2-4, A-3	0	0-10	95-100	95-100	50-80	5-30	---	NP
	7-23	Sand, loamy sand, gravelly loamy sand.	SP, SM, SP-SM	A-2-4, A-3, A-1-b	0	0-10	90-100	85-100	40-75	0-15	---	NP
	23-54	Clay loam, loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	0-10	85-95	85-95	80-95	60-90	25-40	5-20
	54-80	Loam, clay loam, silty clay loam.	CL, CL-ML, SC, SC-SM	A-4, A-6, A-1, A-2	0	0-10	95-100	85-95	45-95	20-80	25-40	5-20

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 10 inches	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
442E:												
Curtisville--	0-5	Sandy loam----	SC-SM, SC	A-2, A-4	0	0-5	90-100	75-100	45-75	20-40	21-30	4-11
	5-16	Sandy loam, clay loam, loam.	CL, SC	A-2, A-4, A-6	0	0-5	90-100	75-100	45-100	20-90	25-39	7-18
	16-29	Clay, clay loam, silty clay loam.	CL, CH	A-7	0	0-5	90-100	75-100	75-100	55-95	44-53	21-28
	29-80	Clay loam, silty clay loam.	CL	A-7	0	0-5	90-100	75-100	75-100	50-95	39-48	18-25
443B:												
Kawkawlin----	0-13	Sandy loam----	SM, SC, SC-SM, ML	A-2, A-4	0	0-5	95-100	85-100	50-85	25-55	0-30	NP-9
	13-37	Clay loam, silty clay loam, clay.	CL, CH	A-7	0	0-5	95-100	85-100	75-100	55-95	40-55	20-30
	37-80	Clay loam, silty clay loam.	CL	A-6, A-7	0	0-5	95-100	85-100	75-100	50-95	35-50	15-25
Allendale----	0-6	Loamy sand----	SM, SP-SM	A-2-4, A-1-b, A-4	0	0	95-100	90-100	45-80	10-40	0-14	NP
	6-32	Sand, loamy sand, loamy fine sand.	SM, SP-SM	A-2-4, A-3, A-4, A-1-b	0	0	95-100	90-100	45-80	5-40	0-14	NP
	32-80	Silty clay, clay.	CH, MH	A-7	0	0	100	90-100	90-100	75-95	50-70	20-40
Aquepts------	0-80	Variable------	---	---	---	---	---	---	---	---	---	---
444B---------- Kawkawlin	0-13	Sandy loam----	SM, SC, SC-SM, ML	A-2, A-4	0	0-5	95-100	85-100	50-85	25-55	0-30	NP-9
	13-37	Clay loam, silty clay loam, clay.	CL, CH	A-7	0	0-5	95-100	85-100	75-100	55-95	40-55	20-30
	37-80	Clay loam, silty clay loam.	CL	A-6, A-7	0	0-5	95-100	85-100	75-100	50-95	35-50	15-25
445A---------- Corsair	0-8	Very fine sandy loam.	SC, SC-SM, CL-ML	A-4	0	0	95-100	85-100	70-85	40-65	15-25	5-10
	8-10	Fine sand, loamy fine sand.	SM	A-2	0	0	95-100	85-100	55-80	15-35	0-14	NP
	10-15	Fine sandy loam, loam, silt loam.	SC-SM, CL-ML, SC	A-4	0	0	95-100	85-100	70-95	45-80	20-30	5-10
	15-80	Stratified silt to sand.	SP-SM, ML	A-2, A-4, A-1-b	0	0	95-100	85-100	0-100	0-100	15-25	NP-7

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct	Pct					Pct	
446B:												
Wurtsmith----	0-4	Sand----------	SP-SM, SM, SP	A-1, A-2, A-3	0	0	95-100	90-100	45-70	3-15	0-14	NP
	4-24	Sand----------	SP-SM, SM, SP	A-1, A-2, A-3	0	0	95-100	90-100	45-70	3-15	0-14	NP
	24-80	Sand----------	SP-SM, SM, SP	A-1, A-2, A-3	0	0	95-100	90-100	45-70	3-15	0-14	NP
Meehan-------	0-2	Sand----------	SM, SP-SM	A-1, A-3, A-2	0	0	90-100	75-100	40-90	5-15	---	NP
	2-43	Sand, loamy sand, loamy coarse sand.	SM, SP-SM, SP	A-1, A-2, A-3	0	0	90-100	75-100	40-90	3-30	---	NP
	43-80	Sand, coarse sand.	SP, SP-SM	A-1, A-3, A-2	0	0	90-100	75-100	40-90	0-5	---	NP
Urban land.												
447A---------- Whittemore	0-12	Sand----------	SM, SP-SM	A-1, A-2, A-3	0	0	95-100	95-100	50-70	5-15	---	NP
	12-17	Sand----------	SM, SP-SM	A-1, A-2, A-3	0	0	95-100	95-100	50-70	5-15	---	NP
	17-35	Sand, loamy sand.	SM, SP-SM	A-2, A-3	0	0	95-100	95-100	50-75	10-20	---	NP
	35-44	Silty clay, clay.	CL, CH	A-7	0	0	95-100	95-100	90-100	90-95	40-70	25-40
	44-80	Silty clay----	CL, CH	A-7	0	0	95-100	95-100	90-100	90-95	40-70	25-40
448A:												
Meehan-------	0-2	Sand----------	SM, SP-SM	A-1, A-2, A-3	0	0	90-100	75-100	40-90	5-15	0-14	NP
	2-43	Sand, loamy sand, loamy coarse sand.	SM, SP-SM, SP	A-2, A-1, A-3	0	0	90-100	75-100	40-90	3-30	0-14	NP
	43-80	Sand, coarse sand.	SP, SP-SM	A-2, A-1, A-3	0	0	90-100	75-100	40-90	0-5	0-14	NP
Tawas--------	0-24	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	24-80	Sand, loamy fine sand, gravelly sand.	SP, SM, SP-SM	A-2-4, A-1-b, A-3, A-4	0	0	80-100	60-100	30-80	0-40	0-14	NP
449A---------- Kokosing	0-9	Sand----------	SM, SP-SM	A-1, A-2, A-3	0	0-5	100	95-100	35-70	5-15	---	NP
	9-27	Sand, loamy sand.	SM, SP-SM	A-2, A-1, A-3	0	0-5	100	95-100	35-70	5-15	---	NP
	27-53	Loam, sandy loam, sandy clay loam.	CL, SC	A-4, A-6	0	0-5	100	95-100	60-95	30-75	28-43	9-21
	53-80	Loam, clay loam, sandy clay loam.	CL, SC	A-4, A-6	0	0-5	100	95-100	90-100	30-80	28-43	9-21

Table 18.--Physical and Chemical Properties of the Soils

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
12B:											
Tawas-----------	0-24	---	0.30-0.55	0.2-6.0	0.35-0.45	4.5-7.8	-------------	----	2	2	40-60
	24-80	0-10	1.40-1.65	6.0-20	0.03-0.10	5.6-8.4	Low----------	0.15			
Au Gres---------	0-9	0-8	1.30-1.55	6.0-20	0.07-0.10	3.5-7.3	Low----------	0.10	5	1	2-4
	9-29	1-15	1.50-1.70	6.0-20	0.06-0.09	3.5-7.3	Low----------	0.10			
	29-80	0-8	1.50-1.70	6.0-20	0.05-0.07	4.5-7.3	Low----------	0.10			
13:											
Tawas-----------	0-24	---	0.30-0.55	0.2-6.0	0.35-0.45	4.5-7.8	-------------	----	2	2	40-60
	24-80	0-10	1.40-1.65	6.0-20	0.03-0.10	5.6-8.4	Low----------	0.15			
Lupton----------	0-30	0-0	0.10-0.35	0.2-6.0	0.35-0.45	5.6-7.8	-------------	----	3	2	70-90
	30-80	0-0	0.10-0.35	0.2-6.0	0.35-0.45	5.6-7.8	-------------	----			
15A:											
Croswell--------	0-7	0-10	1.30-1.55	6.0-20	0.06-0.09	3.5-6.5	Low----------	0.10	5	1	.5-2
	7-26	0-10	1.40-1.60	6.0-20	0.06-0.10	3.5-7.3	Low----------	0.10			
	26-36	0-10	1.40-1.60	6.0-20	0.06-0.09	3.5-7.3	Low----------	0.10			
	36-80	0-10	1.50-1.65	6.0-20	0.05-0.07	3.5-8.4	Low----------	0.10			
Au Gres---------	0-9	0-8	1.30-1.55	6.0-20	0.07-0.10	3.5-7.3	Low----------	0.10	5	1	2-4
	9-29	1-15	1.50-1.70	6.0-20	0.06-0.09	3.5-7.3	Low----------	0.10			
	29-80	0-8	1.50-1.70	6.0-20	0.05-0.07	4.5-7.3	Low----------	0.10			
16B-------------- Graycalm	0-4	0-10	1.30-1.55	6.0-20	0.04-0.10	3.5-6.5	Low----------	0.10	5	1	.5-2
	4-45	0-15	1.25-1.60	6.0-20	0.05-0.10	3.5-7.3	Low----------	0.10			
	45-80	0-10	1.50-1.65	6.0-20	0.04-0.09	3.5-7.3	Low----------	0.10			
16D-------------- Graycalm	0-1	0-10	1.30-1.55	6.0-20	0.04-0.10	3.5-6.5	Low----------	0.10	5	1	.5-2
	1-4	0-15	1.25-1.60	6.0-20	0.05-0.10	3.5-7.3	Low----------	0.10			
	4-46	0-10	1.50-1.65	6.0-20	0.04-0.09	3.5-7.3	Low----------	0.10			
	46-80	0-10	1.50-1.65	6.0-20	0.04-0.06	3.5-8.4	Low----------	0.10			
17B-------------- Croswell	0-7	0-10	1.30-1.55	6.0-20	0.06-0.09	3.5-6.5	Low----------	0.10	5	1	.5-2
	7-26	0-10	1.40-1.60	6.0-20	0.06-0.10	3.5-7.3	Low----------	0.10			
	26-36	0-10	1.40-1.60	6.0-20	0.06-0.09	3.5-7.3	Low----------	0.10			
	36-80	0-10	1.50-1.65	6.0-20	0.05-0.07	3.5-8.4	Low----------	0.10			
18A-------------- Au Gres	0-9	0-8	1.30-1.55	6.0-20	0.07-0.10	3.5-7.3	Low----------	0.10	5	1	2-4
	9-29	1-15	1.50-1.70	6.0-20	0.06-0.09	3.5-7.3	Low----------	0.10			
	29-80	0-8	1.50-1.70	6.0-20	0.05-0.07	4.5-7.3	Low----------	0.10			
19--------------- Leafriver	0-10	---	0.10-0.25	0.6-6.0	0.35-0.50	5.6-7.3	-------------	----	5	2	50-90
	10-14	3-18	1.40-1.65	2.0-20	0.08-0.14	5.6-7.3	Low----------	0.17			
	14-80	0-10	1.50-1.65	6.0-20	0.03-0.08	5.6-7.3	Low----------	0.17			
25B, 25C--------- Kent	0-8	12-20	1.50-1.70	2.0-6.0	0.14-0.18	5.6-7.3	Low----------	0.24	5	3	1-3
	8-26	45-60	1.40-1.70	0.06-0.2	0.09-0.13	5.6-7.8	High---------	0.28			
	26-80	45-60	1.60-1.70	0.06-0.2	0.08-0.12	7.4-8.4	High---------	0.28			
26B-------------- Cublake	0-3	0-8	1.35-1.60	6.0-20	0.05-0.09	3.5-6.0	Low----------	0.15	5	1	.5-2
	3-5	0-10	1.35-1.65	6.0-20	0.05-0.12	3.5-6.0	Low----------	0.17			
	5-24	0-10	1.40-1.70	6.0-20	0.04-0.11	3.5-6.0	Low----------	0.17			
	24-45	0-5	1.45-1.70	6.0-20	0.04-0.11	3.1-7.3	Low----------	0.15			
	45-80	10-25	1.40-1.80	0.2-0.6	0.12-0.18	5.1-7.3	Low----------	0.32			

Table 18.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
27A-------------- Tacoda	0-3	0-5	1.40-1.60	6.0-20	0.07-0.09	4.5-5.0	Low-----------	0.15	4	1	2-4
	3-15	0-5	1.40-1.60	6.0-20	0.06-0.08	4.5-5.5	Low-----------	0.15			
	15-23	0-5	1.30-1.65	6.0-20	0.06-0.08	4.5-5.5	Low-----------	0.15			
	23-45	0-5	1.45-1.65	6.0-20	0.06-0.08	4.5-5.5	Low-----------	0.15			
	45-80	40-60	1.60-1.70	0.01-0.06	0.08-0.12	7.9-8.4	High----------	0.32			
28B-------------- East Lake	0-7	0-8	1.30-1.60	6.0-20	0.05-0.09	5.6-7.3	Low-----------	0.15	5	1	.5-2
	7-30	0-10	1.30-1.60	6.0-20	0.07-0.10	5.6-7.3	Low-----------	0.15			
	30-80	0-10	1.50-1.65	>20	0.02-0.06	7.4-8.4	Low-----------	0.10			
39B, 39C--------- Glennie	0-5	2-10	1.35-1.60	2.0-6.0	0.09-0.12	5.1-7.3	Low-----------	0.17	4	2	1-3
	5-18	5-15	1.35-1.70	2.0-6.0	0.10-0.14	5.1-7.3	Low-----------	0.24			
	18-38	5-27	1.35-1.70	0.01-0.06	0.03-0.05	5.6-7.3	Low-----------	0.37			
	38-44	5-27	1.80-2.10	0.01-0.06	0.04-0.05	5.6-7.3	Low-----------	0.37			
	44-54	20-35	1.80-2.10	0.01-0.06	0.04-0.05	5.6-7.3	High----------	0.37			
	54-85	15-40	1.80-2.10	0.01-0.06	0.04-0.05	7.4-8.4	Moderate------	0.37			
40A-------------- Sprinkler	0-5	5-18	1.20-1.50	0.6-2.0	0.13-0.15	5.1-6.0	Low-----------	0.28	5	3	2-4
	5-13	5-18	1.35-1.60	0.6-2.0	0.12-0.14	5.1-6.0	Low-----------	0.28			
	13-28	15-35	1.65-1.80	0.2-0.6	0.03-0.05	5.1-6.0	Moderate------	0.37			
	28-35	18-35	1.65-1.80	0.2-0.6	0.03-0.05	5.1-6.0	Moderate------	0.37			
	35-44	18-35	1.65-1.80	0.2-0.6	0.03-0.05	5.6-6.5	Moderate------	0.37			
	44-80	18-35	1.50-1.70	0.6-2.0	0.03-0.05	7.9-8.4	Moderate------	0.37			
47D, 47F--------- Graycalm	0-4	0-10	1.30-1.55	6.0-20	0.04-0.10	3.5-6.5	Low-----------	0.10	5	1	.5-2
	4-45	0-15	1.25-1.60	6.0-20	0.05-0.10	3.5-7.3	Low-----------	0.10			
	45-80	0-10	1.50-1.65	6.0-20	0.04-0.09	3.5-7.3	Low-----------	0.10			
53B-------------- Negwegon	0-6	12-27	1.40-1.60	0.6-2.0	0.22-0.24	5.6-7.8	Low-----------	0.37	4	5	1-3
	6-34	35-60	1.40-1.70	0.01-0.06	0.11-0.20	5.6-7.8	High----------	0.32			
	34-80	35-60	1.40-1.70	0.01-0.06	0.11-0.20	7.9-8.4	High----------	0.32			
53C-------------- Negwegon	0-6	12-27	1.40-1.60	0.6-2.0	0.22-0.24	5.6-7.8	Low-----------	0.37	4	5	1-3
	6-34	35-60	1.40-1.70	0.01-0.06	0.11-0.20	5.6-7.8	High----------	0.32			
	34-80	35-60	1.40-1.70	0.01-0.06	0.11-0.20	7.9-8.4	High----------	0.32			
54A-------------- Algonquin	0-7	15-27	1.20-1.55	0.6-2.0	0.22-0.24	6.6-7.3	Low-----------	0.37	5	6	2-3
	7-14	35-60	1.40-1.60	0.06-0.2	0.11-0.20	7.4-8.4	High----------	0.32			
	14-29	35-60	1.40-1.60	0.01-0.06	0.11-0.20	7.9-8.4	High----------	0.32			
	29-80	35-60	1.40-1.70	0.01-0.06	0.11-0.20	7.9-8.4	High----------	0.32			
55--------------- Springport	0-8	27-40	1.25-1.50	0.2-0.6	0.17-0.19	6.6-7.8	Moderate------	0.32	5	6	2-5
	8-12	40-60	1.40-1.65	0.06-0.2	0.11-0.20	7.4-8.4	High----------	0.32			
	12-27	35-60	1.40-1.70	0.01-0.06	0.11-0.20	7.4-8.4	High----------	0.32			
	27-80	35-65	1.40-1.70	0.01-0.06	0.11-0.20	7.4-8.4	High----------	0.32			
56C-------------- Nester	0-9	7-27	1.25-1.60	0.6-2.0	0.20-0.24	5.1-7.3	Low-----------	0.28	5	5	1-3
	9-19	5-25	1.25-1.60	0.6-2.0	0.15-0.22	5.1-7.3	Low-----------	0.28			
	19-40	35-45	1.40-1.60	0.06-0.2	0.08-0.17	5.1-8.4	Moderate------	0.28			
	40-80	30-40	1.40-1.65	0.06-0.2	0.10-0.17	7.9-8.4	Moderate------	0.32			
57B-------------- Kawkawlin	0-10	8-27	1.45-1.60	0.6-2.0	0.20-0.22	5.1-7.3	Low-----------	0.37	5	5	2-4
	10-29	35-45	1.45-1.60	0.06-0.2	0.10-0.20	5.1-7.8	Moderate------	0.32			
	29-80	30-40	1.50-1.60	0.06-0.2	0.13-0.20	7.9-8.4	Moderate------	0.32			

Table 18.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
58A:											
Wakeley----------	0-5	---	0.30-0.40	6.0-20	0.35-0.45	5.6-7.8	-------------	----	4	2	40-60
	5-27	0-15	1.45-1.60	6.0-20	0.05-0.10	5.6-7.8	Low----------	0.10			
	27-80	35-60	1.50-1.70	0.01-0.06	0.08-0.12	7.4-8.4	High---------	0.32			
Allendale--------	0-6	0-10	1.25-1.40	6.0-20	0.07-0.09	4.5-7.3	Low----------	0.15	4	2	2-4
	6-32	0-15	1.35-1.45	6.0-20	0.06-0.10	4.5-7.3	Low----------	0.17			
	32-80	40-60	1.45-1.70	0.01-0.06	0.08-0.12	6.1-8.4	High---------	0.32			
59B:											
Algonquin--------	0-7	15-27	1.20-1.55	0.6-2.0	0.22-0.24	6.6-7.3	Low----------	0.37	5	6	2-3
	7-14	35-60	1.40-1.60	0.06-0.2	0.11-0.20	7.4-8.4	High---------	0.32			
	14-29	35-60	1.40-1.60	0.01-0.06	0.11-0.20	7.9-8.4	High---------	0.32			
	29-80	35-60	1.40-1.70	0.01-0.06	0.11-0.20	7.9-8.4	High---------	0.32			
Springport-------	0-8	27-40	1.25-1.50	0.2-0.6	0.17-0.19	6.6-7.8	Moderate-----	0.32	5	6	2-5
	8-12	40-60	1.40-1.65	0.06-0.2	0.11-0.20	7.4-8.4	High---------	0.32			
	12-27	35-60	1.40-1.70	0.01-0.06	0.11-0.20	7.4-8.4	High---------	0.32			
	27-80	35-65	1.40-1.70	0.01-0.06	0.11-0.20	7.4-8.4	High---------	0.32			
62A-------------- Allendale	0-6	0-12	1.25-1.40	6.0-20	0.09-0.12	4.5-7.3	Low----------	0.17	4	2	2-4
	6-32	0-15	1.35-1.45	6.0-20	0.06-0.10	4.5-7.3	Low----------	0.17			
	32-80	40-60	1.45-1.70	0.01-0.06	0.08-0.12	6.1-8.4	High---------	0.32			
70-------------- Lupton	0-30	0-0	0.10-0.35	0.2-6.0	0.35-0.45	5.6-7.8	-------------	----	3	2	70-90
	30-80	0-0	0.10-0.35	0.2-6.0	0.35-0.45	5.6-7.8	-------------	----			
71-------------- Tawas	0-24	---	0.30-0.55	0.2-6.0	0.35-0.45	4.5-7.8	-------------	----	2	2	40-60
	24-80	0-10	1.40-1.65	6.0-20	0.03-0.10	5.6-8.4	Low----------	0.15			
72-------------- Dorval	0-18	---	0.13-0.42	0.6-6.0	0.20-0.25	5.1-7.8	-------------	----	2	2	50-95
	18-80	35-60	1.40-1.65	0.01.06	0.10-0.20	6.1-8.4	High---------	0.28			
75B, 75D--------- Rubicon	0-8	0-5	1.25-1.45	6.0-20	0.05-0.09	4.5-6.0	Low----------	0.10	5	1	.5-2
	8-23	0-10	1.30-1.60	6.0-20	0.04-0.08	4.5-6.0	Low----------	0.10			
	23-80	0-5	1.40-1.65	6.0-20	0.04-0.06	4.5-6.5	Low----------	0.10			
75E, 75F--------- Rubicon	0-4	0-5	1.25-1.45	6.0-20	0.05-0.09	4.5-6.0	Low----------	0.10	5	1	.5-2
	4-23	0-10	1.30-1.60	6.0-20	0.04-0.08	4.5-6.0	Low----------	0.10			
	23-80	0-5	1.40-1.65	6.0-20	0.04-0.06	4.5-6.5	Low----------	0.10			
77-------------- Rollaway	0-9	---	0.30-0.40	0.2-6.0	0.35-0.45	6.1-7.3	-------------	----	5	2	40-70
	9-13	12-20	1.40-1.60	0.6-2.0	0.20-0.22	6.1-8.4	Low----------	0.37			
	13-18	12-20	1.40-1.60	0.6-2.0	0.20-0.22	6.1-8.4	Low----------	0.37			
	18-55	5-15	1.40-1.65	0.6-2.0	0.09-0.12	6.1-8.4	Low----------	0.28			
	55-80	40-60	1.40-1.60	0.01-06	0.10-0.12	6.1-8.4	High---------	0.28			
78. Pits											
81B, 81D, 81E---- Grayling	0-3	0-10	1.30-1.65	6.0-20	0.07-0.09	3.5-5.5	Low----------	0.15	5	1	1-6
	3-20	0-10	1.30-1.65	6.0-20	0.06-0.08	3.5-5.5	Low----------	0.15			
	20-41	0-10	1.45-1.65	6.0-20	0.04-0.06	3.5-6.5	Low----------	0.15			
	41-80	0-10	1.45-1.65	6.0-20	0.04-0.06	3.5-8.4	Low----------	0.15			
82C------------- Udorthents	0-12	25-35	1.50-1.70	0.2-0.6	0.11-0.18	---	Moderate-----	0.24	5	4	---
	12-80	---	---	---	---	---	-------------	----			
82F------------- Udorthents	0-24	2-18	1.50-1.70	0.2-0.6	0.11-0.18	---	Moderate-----	0.24	5	4	---
	24-80	---	---	---	---	---	-------------	----			

Table 18.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
83B-------------- Udipsamments	0-80	0-10	1.35-1.65	6.0-20	0.05-0.09	5.1-6.5	Low-----------	0.12	5	1	.5-1
84B-------------- Zimmerman	0-2	2-12	1.27-1.56	6.0-20	0.10-0.12	4.5-6.5	Low-----------	0.17	5	2	1-2
	2-80	0-12	1.60-1.70	6.0-20	0.06-0.10	6.1-7.3	Low-----------	0.17			
86:											
Histosols--------	0-51	---	---	0.2-6.0	---	---	-------------	----	3	2	50-70
	51-80	---	---	---	---	---	-------------	----			
Aquents----------	0-80	---	---	---	---	---	-------------	----	---	---	---
93B:											
Tacoda-----------	0-3	0-5	1.40-1.60	6.0-20	0.07-0.09	4.5-5.0	Low-----------	0.15	4	1	2-4
	3-15	0-5	1.40-1.60	6.0-20	0.06-0.08	4.5-5.5	Low-----------	0.15			
	15-23	0-5	1.30-1.65	6.0-20	0.06-0.08	4.5-5.5	Low-----------	0.15			
	23-45	0-5	1.45-1.65	6.0-20	0.06-0.08	4.5-5.5	Low-----------	0.15			
	45-80	40-60	1.60-1.70	0.01-0.06	0.08-0.12	7.9-8.4	High----------	0.32			
Wakeley----------	0-5	---	0.30-0.40	6.0-20	0.35-0.45	5.6-7.8	-------------	----	4	2	40-60
	5-27	0-15	1.45-1.60	6.0-20	0.05-0.10	5.6-7.8	Low-----------	0.10			
	27-80	35-60	1.50-1.70	0.01-0.06	0.08-0.12	7.4-8.4	High----------	0.32			
97--------------- Colonville	0-16	10-15	1.35-1.45	0.6-2.0	0.20-0.22	6.6-8.4	Low-----------	0.28	5	3	2-4
	16-80	0-18	1.40-1.65	0.6-6.0	0.02-0.12	7.4-8.4	Low-----------	0.15			
100D, 100E------- Curtisville	0-5	10-20	1.35-1.55	2.0-6.0	0.13-0.15	5.1-6.5	Low-----------	0.24	5	3	1-3
	5-16	15-30	1.40-1.70	0.6-2.0	0.15-0.19	4.5-6.5	Low-----------	0.32			
	16-29	35-45	1.40-1.70	0.06-0.2	0.09-0.19	5.6-7.3	Moderate------	0.32			
	29-80	30-40	1.45-1.65	0.06-0.2	0.10-0.17	7.4-8.4	Moderate------	0.32			
103B, 103C------- Nester	0-11	5-20	1.25-1.60	2.0-6.0	0.13-0.15	5.1-7.3	Low-----------	0.20	5	3	1-3
	11-17	5-25	1.25-1.60	0.6-2.0	0.15-0.22	5.1-7.3	Low-----------	0.28			
	17-34	35-45	1.40-1.60	0.06-0.2	0.08-0.17	5.1-8.4	Moderate------	0.28			
	34-80	30-40	1.40-1.65	0.06-0.2	0.10-0.17	7.9-8.4	Moderate------	0.32			
108B------------- Selkirk	0-9	15-27	1.30-1.60	0.6-2.0	0.18-0.24	5.6-7.3	Low-----------	0.37	5	5	2-4
	9-15	15-35	1.30-1.60	0.6-2.0	0.12-0.18	5.6-7.3	Moderate------	0.32			
	15-21	45-60	1.40-1.60	0.06-0.2	0.08-0.13	5.6-7.3	High----------	0.28			
	21-80	45-60	1.40-1.60	0.06-0.2	0.07-0.12	7.4-8.4	High----------	0.28			
114A------------- Ingalls	0-12	0-5	1.25-1.40	6.0-20	0.05-0.10	4.5-7.3	Low-----------	0.15	5	1	.5-3
	12-27	3-15	1.35-1.45	6.0-20	0.05-0.10	4.5-7.3	Low-----------	0.17			
	27-80	2-20	1.45-1.80	0.2-0.6	0.09-0.22	5.6-8.4	Low-----------	0.43			
120B, 120C------- Morganlake	0-4	1-10	1.30-1.55	6.0-20	0.07-0.12	3.5-7.3	Low-----------	0.15	5	1	.5-1
	4-23	1-10	1.40-1.65	6.0-20	0.06-0.08	3.5-6.0	Low-----------	0.15			
	23-29	1-10	1.40-1.65	6.0-20	0.09-0.11	3.5-6.0	Low-----------	0.15			
	29-47	27-35	1.45-1.70	0.2-0.6	0.14-0.16	5.6-7.8	Moderate------	0.37			
	47-80	27-35	1.45-1.70	0.2-0.6	0.14-0.16	7.4-8.4	Moderate------	0.37			
123D------------- Klacking	0-2	0-10	1.35-1.65	6.0-20	0.05-0.09	4.5-6.0	Low-----------	0.10	5	1	1-2
	2-34	0-10	1.35-1.65	6.0-20	0.05-0.08	4.5-7.3	Low-----------	0.10			
	34-80	2-15	1.55-1.70	2.0-6.0	0.05-0.11	4.5-7.3	Low-----------	0.15			
124-------------- Evart	0-14	0-10	1.35-1.50	6.0-20	0.06-0.09	6.1-7.8	Low-----------	0.15	5	1	1-6
	14-80	0-15	1.40-1.65	6.0-20	0.05-0.10	6.1-8.4	Low-----------	0.15			
127-------------- Cathro	0-19	0-0	0.28-0.45	0.2-6.0	0.35-0.45	4.5-7.8	-------------	----	2	2	60-85
	19-30	0-0	0.15-0.30	0.2-6.0	0.35-0.45	4.5-7.8	-------------	0.24			
	30-80	10-30	1.50-1.70	0.2-2.0	0.11-0.22	5.6-8.4	Low-----------	0.32			

Table 18.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
128-------------- Dawson	0-3	---	0.15-0.30	0.2-6.0	0.55-0.65	3.6-4.4	-------------	----	2	7	65-85
	3-27	---	0.15-0.40	0.2-6.0	0.35-0.45	3.6-4.4	-------------	----			
	27-80	0-10	1.55-1.75	6.0-20	0.03-0.10	4.5-6.5	Low----------	0.10			
130-------------- Grousehaven	0-12	0-0	0.10-0.25	0.2-6.0	0.35-0.45	6.6-8.4	Low----------	----	3	2	40-70
	12-80	0-0	0.05-0.20	0.01-0.06	0.20-0.22	7.4-8.4	Low----------	----			
159A------------- Finch	0-3	0-8	1.20-1.50	6.0-20	0.07-0.09	3.5-6.0	Low----------	0.15	2	1	2-10
	3-12	5-10	1.30-1.55	6.0-20	0.06-0.08	3.5-6.0	Low----------	0.15			
	12-21	5-10	1.75-2.05	2.0-6.0	0.02-0.04	3.5-6.5	Low----------	0.15			
	21-80	0-10	1.40-1.55	6.0-20	0.02-0.04	3.5-7.8	Low----------	0.15			
182. Pits											
197A------------- Gladwin	0-7	0-12	1.25-1.65	6.0-20	0.08-0.12	5.1-7.8	Low----------	0.17	5	2	2-4
	7-22	2-15	1.35-1.65	6.0-20	0.05-0.11	5.1-6.0	Low----------	0.17			
	22-26	5-18	1.25-1.65	2.0-20	0.05-0.14	5.6-7.8	Low----------	0.17			
	26-80	0-5	1.35-1.60	>20	0.02-0.04	7.9-8.4	Low----------	0.10			
209B, 209C, 209D- Grayling	0-2	0-4	1.30-1.55	6.0-20	0.06-0.08	4.5-6.5	Low----------	0.15	5	1	1-5
	2-29	0-4	1.40-1.60	6.0-20	0.05-0.07	4.5-6.5	Low----------	0.15			
	29-70	0-4	1.50-1.65	6.0-20	0.04-0.06	5.1-6.5	Low----------	0.15			
	70-99	0-4	1.50-1.65	6.0-20	0.04-0.12	7.4-8.4	Low----------	0.15			
210B, 210C, 210D, 210E------------ Grayling	0-2	0-10	1.30-1.65	6.0-20	0.07-0.09	3.5-5.5	Low----------	0.15	5	1	1-6
	2-29	0-10	1.45-1.65	6.0-20	0.04-0.06	3.5-6.5	Low----------	0.15			
	29-99	0-10	1.45-1.65	6.0-20	0.04-0.06	3.5-8.4	Low----------	0.15			
211B------------ Grayling	0-3	0-4	1.30-1.55	6.0-20	0.06-0.08	4.5-6.5	Low----------	0.15	5	1	1-5
	3-60	0-4	1.40-1.60	6.0-20	0.05-0.07	4.5-6.5	Low----------	0.15			
	60-80	0-4	1.50-1.65	6.0-20	0.04-0.06	4.5-6.5	Low----------	0.15			
	80-99	0-20	1.55-1.70	0.6-20	0.04-0.12	4.5-6.5	Low----------	0.20			
212B------------ Grayling	0-3	0-4	1.30-1.55	6.0-20	0.07-0.09	3.6-5.5	Low----------	0.15	5	1	1-5
	3-30	0-4	1.40-1.60	6.0-20	0.06-0.08	4.5-6.5	Low----------	0.15			
	30-99	0-4	1.50-1.65	6.0-20	0.04-0.06	4.5-6.5	Low----------	0.15			
213B------------ Graycalm	0-1	0-10	1.30-1.55	6.0-20	0.04-0.10	3.5-6.5	Low----------	0.10	5	1	.5-2
	1-46	0-15	1.25-1.60	6.0-20	0.05-0.10	3.5-7.3	Low----------	0.10			
	46-70	0-10	1.50-1.65	6.0-20	0.04-0.09	3.5-7.3	Low----------	0.10			
	70-99	0-10	1.50-1.65	6.0-20	0.04-0.06	3.5-8.4	Low----------	0.10			
214B------------ Typic Udipsamments	0-2	0-5	1.30-1.55	6.0-20	0.06-0.08	4.5-6.5	Low----------	0.15	5	1	1-5
	2-37	0-5	1.40-1.60	6.0-20	0.05-0.07	4.5-6.5	Low----------	0.15			
	37-80	0-5	1.50-1.65	6.0-20	0.04-0.06	4.5-6.5	Low----------	0.15			
215B------------ Typic Udipsamments	0-2	0-4	1.30-1.55	6.0-20	0.06-0.08	4.5-6.5	Low----------	0.15	5	1	1-5
	2-25	0-4	1.40-1.60	6.0-20	0.05-0.07	4.5-6.5	Low----------	0.15			
	25-75	0-4	1.50-1.65	6.0-20	0.04-0.06	4.5-6.5	Low----------	0.15			
	75-95	10-30	1.65-1.80	0.2-2.0	0.11-0.17	5.1-6.5	Low----------	0.28			
216B------------ Typic Udipsamments	0-2	0-4	1.30-1.55	6.0-20	0.06-0.08	4.5-6.5	Low----------	0.15	5	1	1-5
	2-25	0-4	1.40-1.60	6.0-20	0.05-0.07	4.5-6.5	Low----------	0.15			
	25-75	0-4	1.50-1.65	6.0-20	0.04-0.06	4.5-6.5	Low----------	0.15			
	75-95	10-30	1.65-1.80	0.2-2.0	0.11-0.17	6.6-8.4	Low----------	0.28			
220B, 220D, 220E- Typic Udipsamments	0-4	0-4	1.30-1.55	6.0-20	0.06-0.08	4.5-6.5	Low----------	0.15	5	1	1-5
	4-40	0-4	1.40-1.60	6.0-20	0.05-0.07	4.5-6.5	Low----------	0.15			
	40-99	0-4	1.50-1.65	6.0-20	0.04-0.06	4.5-6.5	Low----------	0.15			

Table 18.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
221B, 221C, 221D, 221E------------ Typic Udipsamments	0-3	0-4	1.30-1.55	6.0-20	0.06-0.08	4.5-6.5	Low----------	0.15	5	1	1-5
	3-45	0-4	1.40-1.60	6.0-20	0.05-0.07	4.5-6.5	Low----------	0.15			
	45-75	0-4	1.50-1.65	6.0-20	0.04-0.06	4.5-6.5	Low----------	0.15			
	75-99	0-20	1.55-1.70	0.6-20	0.04-0.12	4.5-6.5	Low----------	0.20			
222B------------- Typic Udipsamments	0-2	0-5	1.30-1.55	6.0-20	0.07-0.09	4.5-6.0	Low----------	0.15	5	1	1-5
	2-30	0-5	1.40-1.60	6.0-20	0.05-0.07	4.5-6.5	Low----------	0.15			
	30-99	0-5	1.50-1.65	6.0-20	0.04-0.06	5.6-7.3	Low----------	0.15			
223B, 223C, 223D, 223E:											
Graycalm-------	0-1	0-10	1.30-1.55	6.0-20	0.04-0.10	3.5-6.5	Low----------	0.10	5	1	.5-2
	1-46	0-15	1.25-1.60	6.0-20	0.05-0.10	3.5-7.3	Low----------	0.10			
	46-70	0-10	1.50-1.65	6.0-20	0.04-0.09	3.5-7.3	Low----------	0.10			
	70-99	0-10	1.50-1.65	6.0-20	0.04-0.06	3.5-8.4	Low----------	0.10			
Grayling-------	0-2	0-10	1.30-1.65	6.0-20	0.07-0.09	3.5-5.5	Low----------	0.15	5	1	1-6
	2-29	0-10	1.30-1.65	6.0-20	0.06-0.08	3.5-5.5	Low----------	0.15			
	29-99	0-10	1.45-1.65	6.0-20	0.04-0.06	3.5-8.4	Low----------	0.15			
224B------------- Croswell	0-4	0-10	1.30-1.55	6.0-20	0.06-0.09	3.5-6.5	Low----------	0.10	5	1	.5-2
	4-20	0-10	1.40-1.60	6.0-20	0.06-0.10	3.5-7.3	Low----------	0.10			
	20-99	0-10	1.50-1.65	6.0-20	0.05-0.07	3.5-8.4	Low----------	0.10			
225B, 225C------- Entic Haplorthods	0-4	0-5	1.30-1.55	6.0-20	0.07-0.09	4.5-6.5	Low----------	0.15	5	1	1-5
	4-30	0-5	1.40-1.60	6.0-20	0.05-0.07	4.5-6.5	Low----------	0.15			
	30-55	0-5	1.50-1.65	6.0-20	0.04-0.06	5.6-7.3	Low----------	0.15			
	55-80	20-40	1.30-1.65	0.2-0.6	0.14-0.16	5.6-8.4	Moderate-----	0.37			
231D, 231E:											
Entic Haplorthods----	0-4	0-5	1.30-1.55	6.0-20	0.07-0.09	4.5-6.5	Low----------	0.15	5	1	1-5
	4-60	0-5	1.40-1.60	6.0-20	0.05-0.07	4.5-6.5	Low----------	0.15			
	60-85	0-5	1.50-1.65	6.0-20	0.04-0.06	5.6-7.3	Low----------	0.15			
	85-99	0-20	1.55-1.70	0.6-20	0.07-0.10	5.6-7.3	Low----------	0.17			
Alfic Haplorthods----	0-7	0-10	1.30-1.55	6.0-20	0.06-0.09	5.1-6.5	Low----------	0.15	4	2	1-5
	7-37	0-10	1.35-1.65	6.0-20	0.06-0.10	5.1-6.5	Low----------	0.10			
	37-42	10-22	1.50-1.70	0.2-2.0	0.11-0.18	5.1-6.5	Low----------	0.24			
	42-99	0-10	1.55-1.70	6.0-20	0.04-0.10	6.1-7.3	Low----------	0.10			
232B:											
Entic Haplorthods----	0-3	0-5	1.30-1.55	6.0-20	0.07-0.09	4.5-6.0	Low----------	0.15	5	1	1-5
	3-30	0-5	1.40-1.60	6.0-20	0.05-0.07	4.5-6.5	Low----------	0.15			
	30-99	0-5	1.50-1.65	6.0-20	0.04-0.06	5.6-7.3	Low----------	0.15			
Alfic Haplorthods----	0-7	0-10	1.35-1.65	6.0-20	0.05-0.09	5.1-6.5	Low----------	0.10	4	1	1-5
	7-37	0-10	1.35-1.65	6.0-20	0.06-0.10	5.1-6.5	Low----------	0.15			
	37-42	10-22	1.50-1.70	0.2-2.0	0.11-0.18	5.1-6.5	Low----------	0.24			
	42-99	0-10	1.55-1.70	6.0-20	0.04-0.10	6.1-7.3	Low----------	0.10			
233B, 233C, 233D:											
Alfic Haplorthods----	0-7	0-10	1.30-1.55	6.0-20	0.06-0.09	5.1-6.5	Low----------	0.15	4	2	1-5
	7-37	0-10	1.35-1.65	6.0-20	0.06-0.10	5.1-6.5	Low----------	0.10			
	37-42	10-22	1.50-1.70	0.2-2.0	0.11-0.18	5.1-6.5	Low----------	0.24			
	42-99	0-10	1.55-1.70	6.0-20	0.04-0.10	6.1-7.3	Low----------	0.10			

Table 18.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
233B, 233C, 233D:											
Entic Haplorthods----	0-3	0-5	1.30-1.55	6.0-20	0.07-0.09	4.5-6.5	Low----------	0.15	5	1	1-5
	3-55	0-5	1.40-1.60	6.0-20	0.05-0.07	4.5-6.5	Low----------	0.15			
	55-70	0-5	1.50-1.65	6.0-20	0.04-0.06	5.6-7.3	Low----------	0.15			
	70-95	0-35	1.50-1.70	0.2-20	0.04-0.17	5.6-7.3	Moderate-----	0.28			
235B, 235C:											
Alfic Haplorthods, sandy over loamy----------	0-6	0-10	1.30-1.55	6.0-20	0.06-0.09	5.1-6.5	Low----------	0.15	5	1	1-3
	6-27	0-10	1.30-1.65	6.0-20	0.05-0.11	5.1-6.5	Low----------	0.15			
	27-44	0-10	1.30-1.65	6.0-20	0.05-0.11	5.1-6.5	Low----------	0.15			
	44-52	20-40	1.45-1.60	0.2-0.6	0.15-0.18	5.6-7.3	Moderate-----	0.32			
	52-99	0-15	1.55-1.70	2.0-20	0.04-0.13	6.1-7.8	Low----------	0.17			
Alfic Haplorthods, sandy----------	0-7	0-10	1.30-1.55	6.0-20	0.06-0.09	5.1-6.5	Low----------	0.15	4	2	1-5
	7-37	0-10	1.35-1.65	6.0-20	0.06-0.10	5.1-6.5	Low----------	0.10			
	37-42	10-22	1.50-1.70	0.2-2.0	0.11-0.18	5.1-6.5	Low----------	0.24			
	42-99	0-10	1.55-1.70	6.0-20	0.04-0.10	6.1-7.3	Low----------	0.10			
236B------------- Arenic Eutroboralfs	0-2	0-10	1.35-1.65	6.0-20	0.09-0.12	5.1-6.5	Low----------	0.17	5	2	1-3
	2-4	0-10	1.35-1.65	6.0-20	0.08-0.11	5.1-6.5	Low----------	0.17			
	4-30	0-10	1.35-1.65	6.0-20	0.08-0.11	5.1-6.5	Low----------	0.17			
	30-45	5-22	1.35-1.70	0.6-2.0	0.10-0.16	6.1-7.8	Low----------	0.24			
	45-80	0-10	1.55-1.65	0.6-20	0.04-0.10	6.1-8.4	Low----------	0.15			
237B, 237D------- Eutroboralfs	0-84	---	---	---	---	---	-------------	----	---	---	---
254A:											
Borosaprists----	0-38	0-0	0.15-0.25	0.2-6.0	0.35-0.45	4.5-7.3	-------------	----	3	2	70-99
	38-80	0-0	0.15-0.25	0.2-6.0	0.35-0.45	4.5-7.3	-------------	----			
Fluvaquents-----	0-80	---	---	---	---	---	-------------	----	5	---	---
Aquic Udipsamments---	0-2	0-5	1.20-1.55	6.0-20	0.08-0.10	5.6-6.5	Low----------	0.15	5	1	2-6
	2-45	0-5	1.40-1.60	6.0-20	0.06-0.08	5.1-6.0	Low----------	0.15			
	45-80	0-5	1.50-1.65	6.0-20	0.06-0.08	5.1-6.0	Low----------	0.15			
262A------------- Au Gres	0-10	0-8	1.30-1.55	6.0-20	0.07-0.10	3.5-7.3	Low----------	0.10	5	1	2-4
	10-33	1-15	1.50-1.70	6.0-20	0.06-0.09	3.5-7.3	Low----------	0.10			
	33-80	0-8	1.50-1.70	6.0-20	0.05-0.07	4.5-7.3	Low----------	0.10			
263A------------- Argic Endoaquods	0-80	---	---	---	---	---	-------------	----	5	---	---
264A------------- Allendale	0-13	0-12	1.25-1.40	6.0-20	0.09-0.12	4.5-7.3	Low----------	0.17	4	2	2-4
	13-25	0-15	1.35-1.45	6.0-20	0.06-0.10	4.5-7.3	Low----------	0.17			
	25-80	40-60	1.45-1.70	0.01-0.06	0.08-0.12	6.1-8.4	High---------	0.32			
265B:											
Eutroboralfs----	0-96	---	---	---	---	---	-------------	----	---	---	---
Allendale-------	0-13	0-12	1.25-1.40	6.0-20	0.09-0.12	4.5-7.3	Low----------	0.17	4	2	2-4
	13-25	0-15	1.35-1.45	6.0-20	0.06-0.10	4.5-7.3	Low----------	0.17			
	25-80	40-60	1.45-1.70	0.01-0.06	0.08-0.12	6.1-8.4	High---------	0.32			

Table 18.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
266A-------------- Typic Duraquods	0-10	0-10	1.20-1.50	6.0-20	0.07-0.09	4.5-6.0	Low-----------	0.15	2	1	1-3
	10-27	0-10	1.75-2.05	2.0-6.0	0.02-0.04	4.5-6.5	Low-----------	0.15			
	27-80	0-10	1.40-1.55	6.0-20	0.02-0.04	5.6-7.8	Low-----------	0.15			
272:											
Endoaquods.											
Fluvaquents------	0-80	---	---	---	---	---	-------------	----	5	---	---
273:											
Leafriver--------	0-10	---	0.10-0.25	0.6-6.0	0.35-0.50	5.6-7.3	-------------	----	5	2	50-90
	10-14	3-18	1.40-1.65	2.0-20	0.08-0.14	5.6-7.3	Low-----------	0.17			
	14-80	0-10	1.50-1.65	6.0-20	0.03-0.08	5.6-7.3	Low-----------	0.17			
Wakeley----------	0-6	0-10	1.00-1.20	6.0-20	0.15-0.20	5.6-7.8	Low-----------	0.10	4	1	10-15
	6-29	0-15	1.45-1.60	6.0-20	0.05-0.10	5.6-7.8	Low-----------	0.10			
	29-80	35-60	1.50-1.70	0.01-0.06	0.08-0.12	7.4-8.4	High----------	0.32			
274-------------- Typic Endoaquods	0-4	0-5	0.90-1.50	6.0-20	0.15-0.20	4.5-6.5	Low	.15	5	1	10-15
	4-17	0-5	1.45-1.65	6.0-20	0.06-0.08	4.5-6.5	Low	.15			
	17-80	0-5	1.50-1.65	6.0-20	0.04-0.06	4.5-6.5	Low	.15			
280:											
Aquents----------	0-80	---	---	---	---	---	-------------	----	---	---	---
Histosols--------	0-51	---	---	0.2-6.0	---	---	-------------	----	3	2	50-70
	51-80	---	---	---	---	---	-------------	----			
281-------------- Borosaprists	0-25	0-0	0.15-0.25	0.2-6.0	0.35-0.45	3.6-4.4	-------------	----	3	5	20-99
	25-80	0-0	---	6.0-20	---	---	-------------	----			
282-------------- Borosaprists	0-38	0-0	0.15-0.25	0.2-6.0	0.35-0.45	4.5-7.3	-------------	----	3	2	70-99
	38-80	0-0	0.15-0.25	0.2-6.0	0.35-0.45	4.5-7.3	-------------	----			
343-------------- Sims	0-5	18-27	1.35-1.55	0.6-2.0	0.20-0.22	6.1-7.8	Low-----------	0.24	5	5	3-10
	5-47	35-45	1.40-1.70	0.06-0.2	0.12-0.20	6.1-7.8	Moderate------	0.37			
	47-80	35-40	1.40-1.65	0.06-0.2	0.10-0.18	7.4-8.4	Moderate------	0.37			
355E:											
Crowell----------	0-8	0-10	1.30-1.45	6.0-20	0.07-0.09	3.5-6.0	Low-----------	0.15	2	1	.5-1
	8-17	0-10	1.30-1.45	6.0-20	0.07-0.09	3.5-6.0	Low-----------	0.15			
	17-34	0-10	1.75-2.05	6.0-20	0.06-0.08	5.1-6.0	Low-----------	0.15			
	34-80	0-10	1.40-1.60	6.0-20	0.05-0.07	4.5-6.5	Low-----------	0.15			
Proper-----------	0-3	0-5	1.30-1.55	6.0-20	0.07-0.10	5.6-6.5	Low-----------	0.15	5	1	1-4
	3-10	0-5	1.30-1.55	6.0-20	0.06-0.08	5.6-6.5	Low-----------	0.15			
	10-24	0-5	1.65-2.00	0.6-6.0	0.03-0.04	5.6-7.3	Low-----------	0.15			
	24-38	0-5	1.40-1.60	6.0-20	0.05-0.07	5.6-7.3	Low-----------	0.15			
	38-80	0-5	1.50-1.60	6.0-20	0.05-0.07	5.6-7.3	Low-----------	0.15			
356E:											
Aquepts----------	0-80	---	---	---	---	4.5-7.3	-------------	----	5	---	---
Histosols--------	0-25	---	---	0.2-6.0	---	---	-------------	----	3	2	50-70
	25-80	---	---	---	---	---	-------------	----			
Fluvaquents------	0-80	---	---	---	---	---	-------------	----	5	---	---

Table 18.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
357B:											
Udipsamments----	0-80	0-10	1.35-1.65	6.0-20	0.05-0.09	5.1-6.5	Low----------	0.12	5	1	.5-1
Urban land.											
360--------------	0-5	---	0.30-0.40	6.0-20	0.35-0.45	5.6-7.8	-------------	----	4	2	40-60
Wakeley	5-27	0-15	1.45-1.60	6.0-20	0.05-0.10	5.6-7.8	Low----------	0.10			
	27-80	35-60	1.50-1.70	0.01-0.06	0.08-0.12	7.4-8.4	High---------	0.32			
367A:											
Whittemore------	0-12	0-10	1.20-1.50	6.0-20	0.07-0.09	5.1-6.0	Low----------	0.15	2	1	1-3
	12-17	0-10	1.75-2.00	2.0-6.0	0.01-0.02	5.6-6.0	Low----------	0.15			
	17-35	5-12	1.40-1.60	2.0-20	0.01-0.03	5.6-7.8	Low----------	0.15			
	35-44	40-60	1.45-1.70	0.06-0.2	0.02-0.03	7.9-8.4	High---------	0.32			
	44-80	40-60	1.65-1.80	0.01-0.06	0.02-0.03	7.9-8.4	High---------	0.32			
Springport------	0-10	35-60	1.10-1.35	0.2-0.6	0.17-0.19	6.6-7.8	High---------	0.32	5	4	2-5
	10-36	40-60	1.40-1.65	0.06-0.2	0.11-0.20	7.4-8.4	High---------	0.32			
	36-50	35-60	1.40-1.70	0.01-0.06	0.11-0.20	7.4-8.4	High---------	0.32			
	50-80	35-65	1.40-1.70	0.01-0.06	0.11-0.20	7.4-8.4	High---------	0.32			
368A:											
Au Gres---------	0-9	0-8	1.30-1.55	6.0-20	0.07-0.10	3.5-7.3	Low----------	0.10	5	1	2-4
	9-29	1-15	1.50-1.70	6.0-20	0.06-0.09	3.5-7.3	Low----------	0.10			
	29-80	0-8	1.50-1.70	6.0-20	0.05-0.07	4.5-7.3	Low----------	0.10			
Deford----------	0-5	---	0.30-0.50	0.2-6.0	0.35-0.45	3.5-7.8	-------------	----	5	2	40-60
	5-80	0-12	1.40-1.60	6.0-20	0.05-0.07	4.5-8.4	Low----------	0.17			
369--------------	0-5	---	0.30-0.50	0.2-6.0	0.35-0.45	3.5-7.8	-------------	----	5	2	40-60
Deford	5-80	0-12	1.40-1.60	6.0-20	0.05-0.07	4.5-8.4	Low----------	0.17			
370A-------------	0-2	0-5	1.20-1.55	6.0-20	0.0-0.10	3.5-5.0	Low----------	0.15	3	1	4-8
McIvor	2-18	0-5	1.20-1.55	6.0-20	0.06-0.08	3.5-5.5	Low----------	0.15			
	18-24	0-5	1.75-2.00	2.0-6.0	0.03-0.04	3.5-5.5	Low----------	0.15			
	24-56	0-5	1.50-1.65	6.0-20	0.05-0.07	3.5-5.5	Low----------	0.15			
	56-80	40-60	1.30-1.55	0.01-0.06	0.12-0.17	7.4-7.8	High---------	0.28			
371--------------	0-11	15-27	1.10-1.40	0.2-0.6	0.22-0.24	6.6-7.3	Low----------	0.37	5	6	2-5
Springport	11-23	40-60	1.40-1.65	0.06-0.2	0.11-0.20	7.4-8.4	High---------	0.32			
	23-27	35-60	1.40-1.70	0.01-0.06	0.11-0.20	7.4-8.4	High---------	0.32			
	27-80	35-65	1.40-1.70	0.01-0.06	0.11-0.20	7.4-8.4	High---------	0.32			
372B:											
Proper----------	0-3	0-5	1.30-1.55	6.0-20	0.07-0.10	5.6-6.5	Low----------	0.15	5	1	1-4
	3-10	0-5	1.30-1.55	6.0-20	0.06-0.08	5.6-6.5	Low----------	0.15			
	10-24	0-5	1.65-2.00	6.0-20	0.03-0.04	5.6-7.3	Low----------	0.15			
	24-38	0-5	1.40-1.60	6.0-20	0.05-0.07	5.6-7.3	Low----------	0.15			
	38-80	0-5	1.50-1.60	6.0-20	0.05-0.07	5.6-7.3	Low----------	0.15			
Leafriver-------	0-10	---	0.10-0.25	0.6-6.0	0.35-0.50	5.6-7.3	-------------	----	5	2	50-90
	10-14	3-18	1.40-1.65	2.0-20	0.08-0.14	5.6-7.3	Low----------	0.17			
	14-80	0-10	1.50-1.65	6.0-20	0.03-0.08	5.6-7.3	Low----------	0.17			
375--------------	0-9	---	0.30-0.45	0.2-6.0	0.35-0.45	4.5-5.0	-------------	----	5	2	55-70
Kanotin	9-12	0-10	1.45-1.70	6.0-20	0.06-0.08	4.5-5.0	Low----------	0.15			
	12-51	0-10	1.40-1.65	0.2-0.6	0.05-0.20	4.5-5.0	Low----------	0.43			
	51-58	40-60	1.45-1.75	0.06-0.2	0.09-0.23	7.4-7.8	High---------	0.32			
	58-80	40-60	1.50-1.75	0.06-0.2	0.11-0.18	7.4-8.4	High---------	0.32			

Table 18.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
377---------------	0-6	0-10	0.90-1.50	6.0-20	0.07-0.09	5.6-6.0	Low-----------	0.15	4	2	10-15
Wabun	6-48	0-10	1.45-1.70	6.0-20	0.06-0.08	5.1-7.3	Low-----------	0.15			
	48-58	0-10	1.45-1.70	6.0-20	0.05-0.07	6.6-7.3	Low-----------	0.15			
	58-80	40-60	1.50-1.70	0.06-0.2	0.10-0.12	7.9-8.4	High----------	0.32			
378A--------------	0-9	40-60	1.40-1.60	0.06-0.2	0.11-0.14	7.4-8.4	High----------	0.32	3	4	2-4
Algonquin	9-13	40-60	1.60-1.75	0.06-0.2	0.09-0.11	7.4-8.4	High----------	0.28			
	13-17	40-60	1.60-1.75	0.00-0.06	0.09-0.11	7.4-8.4	High----------	0.28			
	17-80	40-60	1.60-1.75	0.00-0.06	0.08-0.11	7.4-8.4	High----------	0.28			
379A:											
Algonquin--------	0-9	40-60	1.40-1.60	0.06-0.2	0.11-0.14	7.4-8.4	High----------	0.32	3	4	2-4
	9-13	40-60	1.60-1.75	0.06-0.2	0.09-0.11	7.4-8.4	High----------	0.28			
	13-17	40-60	1.60-1.75	0.00-0.06	0.09-0.11	7.4-8.4	High----------	0.28			
	17-80	40-60	1.60-1.75	0.00-0.06	0.08-0.11	7.4-8.4	High----------	0.28			
Springport-------	0-11	15-27	1.10-1.40	0.2-0.6	0.22-0.24	6.6-7.3	Low-----------	0.37	5	6	2-5
	11-23	40-60	1.40-1.65	0.06-0.2	0.11-0.20	7.4-8.4	High----------	0.32			
	23-27	35-60	1.40-1.70	0.00-0.06	0.11-0.20	7.4-8.4	High----------	0.32			
	27-80	35-65	1.40-1.70	0.00-0.06	0.11-0.20	7.4-8.4	High----------	0.32			
380.											
Access denied											
381A:											
McIvor-----------	0-2	0-5	1.20-1.55	6.0-20	0.0-0.10	3.5-5.0	Low-----------	0.15	3	1	4-8
	2-18	0-5	1.20-1.55	6.0-20	0.06-0.08	3.5-5.5	Low-----------	0.15			
	18-24	0-5	1.75-2.00	0.6-6.0	0.03-0.04	3.5-5.5	Low-----------	0.15			
	24-56	0-5	1.50-1.65	6.0-20	0.05-0.07	3.5-5.5	Low-----------	0.15			
	56-80	40-60	1.30-1.55	0.00-0.06	0.12-0.17	7.4-7.8	High----------	0.28			
Wakeley----------	0-5	---	0.30-0.40	6.0-20	0.35-0.45	5.6-7.8	--------------	----	4	2	40-60
	5-27	0-15	1.45-1.60	6.0-20	0.05-0.10	5.6-7.8	Low-----------	0.10			
	27-80	35-60	1.50-1.70	<0.2	0.08-0.12	7.4-8.4	High----------	0.32			
382B--------------	0-3	0-5	1.30-1.55	6.0-20	0.07-0.10	5.6-6.5	Low-----------	0.15	5	1	1-4
Proper	3-10	0-5	1.30-1.55	6.0-20	0.06-0.08	5.6-6.5	Low-----------	0.15			
	10-24	0-5	1.65-2.00	6.0-20	0.03-0.04	5.6-7.3	Low-----------	0.15			
	24-38	0-5	1.40-1.60	6.0-20	0.05-0.07	5.6-7.3	Low-----------	0.15			
	38-80	0-5	1.50-1.60	6.0-20	0.05-0.07	5.6-7.3	Low-----------	0.15			
383B--------------	0-4	0-5	1.30-1.55	6.0-20	0.06-0.09	3.6-6.0	Low-----------	0.15	5	1	.5-2
Wurtsmith	4-24	0-5	1.40-1.60	6.0-20	0.06-0.08	3.6-6.0	Low-----------	0.15			
	24-80	0-5	1.50-1.65	6.0-20	0.05-0.07	3.6-7.3	Low-----------	0.15			
392---------------	0-8	2-10	1.10-1.30	2.0-6.0	0.10-0.15	5.1-7.3	Low-----------	0.15	5	1	10-20
Caffey	8-37	2-10	1.40-1.55	2.0-20	0.06-0.09	6.1-8.4	Low-----------	0.17			
	37-80	10-27	1.50-1.80	0.2-2.0	0.10-0.20	7.4-8.4	Low-----------	0.43			
403B, 403C--------	0-8	15-25	1.25-1.60	0.2-0.6	0.22-0.24	6.6-7.8	Low-----------	0.37	5	6	1-3
Iargo	8-12	35-55	1.35-1.55	0.06-0.2	0.11-0.18	6.6-7.8	High----------	0.32			
	12-19	35-55	1.35-1.55	0.06-0.2	0.11-0.18	6.6-7.8	High----------	0.37			
	19-80	5-45	1.20-1.50	0.06-0.2	0.08-0.18	7.9-8.4	Moderate------	0.32			
404A--------------	0-11	27-40	1.10-1.35	0.06-0.2	0.21-0.23	7.4-8.4	High----------	0.32	5	4	1-4
Manary	11-18	35-55	1.40-1.65	0.06-0.2	0.11-0.20	6.6-8.4	High----------	0.32			
	18-29	35-60	1.50-1.75	0.06-0.2	0.11-0.13	6.6-9.0	High----------	0.28			
	29-80	8-45	1.50-1.75	0.06-0.6	0.08-0.10	7.4-8.4	Moderate------	0.32			

Table 18.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
405B:											
Manary----------	0-11	27-40	1.10-1.35	0.06-0.2	0.21-0.23	7.4-8.4	High---------	0.32	5	4	1-4
	11-18	35-55	1.40-1.65	0.06-0.2	0.11-0.20	6.6-8.4	High---------	0.32			
	18-29	35-60	1.50-1.75	0.06-0.2	0.11-0.13	6.6-9.0	High---------	0.28			
	29-80	8-45	1.50-1.75	0.06-0.6	0.08-0.10	7.4-8.4	Moderate-----	0.32			
Iargo-----------	0-8	15-25	1.25-1.60	0.2-0.6	0.22-0.24	6.6-7.8	Low----------	0.37	5	6	1-3
	8-12	35-55	1.35-1.55	0.06-0.2	0.11-0.18	6.6-7.8	High---------	0.32			
	12-19	35-55	1.35-1.55	0.06-0.2	0.11-0.18	6.6-7.8	High---------	0.37			
	19-80	5-45	1.20-1.50	0.06-0.2	0.08-0.18	7.9-8.4	Moderate-----	0.32			
406A------------- Winterfield	0-8	0-10	0.90-1.20	2.0-20	0.10-0.12	5.6-7.8	Low----------	0.17	5	2	2-4
	8-18	0-10	1.50-1.60	2.0-20	0.09-0.11	5.6-7.8	Low----------	0.17			
	18-80	0-5	1.55-1.65	6.0-20	0.05-0.07	5.6-8.4	Low----------	0.15			
407-------------- Lacota	0-10	12-25	1.30-1.60	0.6-2.0	0.22-0.24	6.1-7.3	Low----------	0.24	4	6	4-6
	10-28	18-35	1.30-1.80	0.2-0.6	0.15-0.20	6.6-7.8	Moderate-----	0.32			
	28-80	0-10	1.50-1.70	6.0-20	0.02-0.04	6.6-8.4	Low----------	0.15			
408-------------- Sims	0-5	18-27	1.35-1.55	0.6-2.0	0.20-0.22	6.1-7.8	Low----------	0.24	5	5	3-10
	5-47	35-45	1.40-1.70	0.06-0.2	0.12-0.20	6.1-7.8	Moderate-----	0.37			
	47-80	35-40	1.40-1.65	0.06-0.2	0.10-0.18	7.4-8.4	Moderate-----	0.37			
409A:											
Finch-----------	0-3	0-8	1.20-1.50	6.0-20	0.07-0.09	3.5-6.0	Low----------	0.15	2	1	2-10
	3-12	5-10	1.30-1.55	6.0-20	0.06-0.08	3.5-6.0	Low----------	0.15			
	12-21	5-10	1.75-2.05	2.0-6.0	0.02-0.04	3.5-6.5	Low----------	0.15			
	21-80	0-10	1.40-1.55	6.0-20	0.02-0.04	3.5-7.8	Low----------	0.15			
Deford----------	0-5	---	0.30-0.50	0.2-6.0	0.35-0.45	3.5-7.8	-------------	----	5	2	40-60
	5-80	0-12	1.40-1.60	6.0-20	0.05-0.07	4.5-8.4	Low----------	0.17			
Au Gres---------	0-9	0-8	1.30-1.55	6.0-20	0.07-0.10	3.5-7.3	Low----------	0.10	5	1	2-4
	9-29	1-15	1.50-1.70	6.0-20	0.06-0.09	3.5-7.3	Low----------	0.10			
	29-80	0-8	1.50-1.70	6.0-20	0.05-0.07	4.5-7.3	Low----------	0.10			
410B:											
Proper----------	0-3	0-5	1.30-1.55	6.0-20	0.07-0.10	5.6-6.5	Low----------	0.15	5	1	1-4
	3-10	0-5	1.30-1.55	6.0-20	0.06-0.08	5.6-6.5	Low----------	0.15			
	10-24	0-5	1.65-2.00	6.0-20	0.03-0.04	5.6-7.3	Low----------	0.15			
	24-38	0-5	1.40-1.60	6.0-20	0.05-0.07	5.6-7.3	Low----------	0.15			
	38-80	0-5	1.50-1.60	6.0-20	0.05-0.07	5.6-7.3	Low----------	0.15			
Finch-----------	0-2	0-8	1.20-1.50	6.0-20	0.07-0.09	3.5-6.0	Low----------	0.15	2	1	2-10
	2-12	5-10	1.30-1.55	6.0-20	0.06-0.08	3.5-6.0	Low----------	0.15			
	12-31	5-10	1.75-2.05	2.0-6.0	0.02-0.04	3.5-6.5	Low----------	0.15			
	31-60	0-10	1.40-1.55	6.0-20	0.02-0.04	3.5-7.8	Low----------	0.15			
Deford----------	0-5	---	0.30-0.50	0.2-6.0	0.35-0.45	3.5-7.8	-------------	----	5	2	40-60
	5-80	0-12	1.40-1.60	6.0-20	0.05-0.07	4.5-8.4	Low----------	0.17			
411A------------- Meehan	0-2	1-4	1.35-1.65	6.0-20	0.07-0.09	3.5-7.3	Low----------	0.15	5	1	.5-3
	2-45	4-9	1.60-1.70	6.0-20	0.06-0.11	3.5-6.5	Low----------	0.15			
	45-80	1-4	1.60-1.70	6.0-20	0.02-0.07	3.5-7.3	Low----------	0.15			
425D------------- Hottis	0-5	12-20	1.50-1.70	2.0-6.0	0.14-0.18	5.6-7.3	Low----------	0.24	5	3	1-3
	5-13	14-24	1.50-1.70	0.6-2.0	0.12-0.19	4.5-6.0	Low----------	0.28			
	13-33	45-60	1.60-1.70	0.06-0.2	0.08-0.12	7.4-8.4	High---------	0.28			
	33-80	45-60	1.40-1.70	0.06-0.2	0.09-0.13	5.6-6.8	High---------	0.28			

Table 18.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
426B, 426C------- Coppler	0-5	0-10	1.35-1.65	2.0-6.0	0.09-0.12	4.5-5.5	Low-----------	0.15	5	2	.5-3
	5-24	2-15	1.30-1.70	2.0-6.0	0.06-0.11	4.5-6.0	Low-----------	0.15			
	24-29	10-25	1.30-1.70	2.0-6.0	0.06-0.12	6.1-7.3	Low-----------	0.10			
	29-80	0-5	1.55-1.70	>20	0.02-0.04	7.4-8.4	Low-----------	0.10			
427-------------- Tonkey	0-7	8-18	1.10-1.60	2.0-6.0	0.13-0.15	5.6-7.8	Low-----------	0.24	5	3	4-7
	7-12	8-18	1.30-1.80	2.0-6.0	0.10-0.15	5.6-7.8	Low-----------	0.24			
	12-17	10-24	1.30-1.80	2.0-6.0	0.12-0.20	5.6-8.4	Low-----------	0.24			
	17-80	0-20	1.60-1.80	2.0-6.0	0.05-0.19	7.4-8.4	Low-----------	0.24			
429D------------- Menominee	0-7	0-10	1.35-1.55	6.0-20	0.08-0.10	3.5-6.5	Low-----------	0.15	5	1	.5-2
	7-23	5-15	1.45-1.70	6.0-20	0.04-0.10	4.5-7.8	Low-----------	0.15			
	23-59	18-35	1.45-1.70	0.2-0.6	0.14-0.18	5.1-7.8	Moderate-----	0.28			
	59-80	12-35	1.45-1.75	0.2-0.6	0.13-0.18	6.6-8.4	Moderate-----	0.32			
430D, 430E------- Mongo	0-5	7-27	1.25-1.60	0.6-2.0	0.20-0.22	6.6-7.3	Low-----------	0.32	5	5	1-3
	5-12	35-60	1.40-1.65	0.01-0.06	0.11-0.20	6.6-7.3	High---------	0.32			
	12-21	35-60	1.40-1.65	0.01-0.06	0.11-0.20	7.4-7.8	High---------	0.32			
	21-80	35-60	1.40-1.65	0.01-0.06	0.11-0.20	7.9-8.4	High---------	0.32			
431B------------- Skeel	0-8	0-15	1.35-1.65	2.0-6.0	0.10-0.12	5.6-6.0	Low-----------	0.17	2	2	.5-2
	8-11	0-10	1.30-1.70	6.0-20	0.07-0.09	5.6-6.5	Low-----------	0.15			
	11-29	0-10	1.70-2.00	6.0-20	0.01-0.02	5.6-6.0	Low-----------	0.15			
	29-36	0-10	1.30-1.70	6.0-20	0.06-0.08	5.1-6.0	Low-----------	0.15			
	36-39	27-40	1.45-1.75	0.2-0.6	0.14-0.16	6.6-7.3	Moderate-----	0.32			
	39-80	27-40	1.45-1.75	0.2-0.6	0.14-0.16	7.4-8.4	Moderate-----	0.32			
432B:											
Wurtsmith--------	0-4	0-5	1.30-1.55	6.0-20	0.06-0.09	3.6-6.0	Low-----------	0.15	5	1	.5-2
	4-24	0-5	1.40-1.60	6.0-20	0.06-0.08	3.6-6.0	Low-----------	0.15			
	24-80	0-5	1.50-1.65	6.0-20	0.05-0.07	3.6-7.3	Low-----------	0.15			
Meehan-----------	0-2	1-4	1.35-1.65	6.0-20	0.07-0.09	3.5-7.3	Low-----------	0.15	5	1	.5-3
	2-43	4-9	1.60-1.70	>6.0	0.06-0.11	3.5-6.5	Low-----------	0.15			
	43-80	1-4	1.60-1.70	>6.0	0.02-0.07	3.5-7.3	Low-----------	0.15			
433B:											
Morganlake-------	0-4	1-10	1.30-1.55	6.0-20	0.07-0.12	3.5-7.3	Low-----------	0.15	5	1	.5-1
	4-23	1-10	1.40-1.65	6.0-20	0.06-0.08	3.5-6.0	Low-----------	0.15			
	23-29	1-10	1.40-1.65	6.0-20	0.09-0.11	3.5-6.0	Low-----------	0.15			
	29-47	27-35	1.45-1.70	0.2-0.6	0.14-0.16	5.6-7.8	Moderate-----	0.37			
	47-80	27-35	1.45-1.70	0.2-0.6	0.14-0.16	7.4-8.4	Moderate-----	0.37			
Graycalm---------	0-4	0-10	1.30-1.55	6.0-20	0.04-0.10	3.5-6.5	Low-----------	0.10	5	1	.5-2
	4-45	0-15	1.25-1.60	6.0-20	0.05-0.10	3.5-7.3	Low-----------	0.10			
	45-80	0-10	1.50-1.65	6.0-20	0.04-0.09	3.5-7.3	Low-----------	0.10			
434D:											
Graycalm---------	0-4	0-10	1.30-1.55	6.0-20	0.04-0.10	3.5-6.5	Low-----------	0.10	5	1	.5-2
	4-45	0-15	1.25-1.60	6.0-20	0.05-0.10	3.5-7.3	Low-----------	0.10			
	45-80	0-10	1.50-1.65	6.0-20	0.04-0.09	3.5-7.3	Low-----------	0.10			
Menominee--------	0-7	0-10	1.35-1.55	6.0-20	0.08-0.10	3.5-6.5	Low-----------	0.15	5	1	.5-2
	7-23	5-15	1.45-1.70	6.0-20	0.04-0.10	4.5-7.8	Low-----------	0.15			
	23-59	18-35	1.45-1.70	0.2-0.6	0.14-0.18	5.1-7.8	Moderate-----	0.28			
	59-80	12-35	1.45-1.75	0.2-0.6	0.13-0.18	6.6-8.4	Moderate-----	0.32			

Table 18.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
434D:											
Morganlake------	0-4	1-10	1.30-1.55	6.0-20	0.07-0.12	3.5-7.3	Low----------	0.15	5	1	.5-1
	4-23	1-10	1.40-1.65	6.0-20	0.06-0.08	3.5-6.0	Low----------	0.15			
	23-29	1-10	1.40-1.65	6.0-20	0.09-0.11	3.5-6.0	Low----------	0.15			
	29-47	27-35	1.45-1.70	0.2-0.6	0.14-0.16	5.6-7.8	Moderate-----	0.37			
	47-80	27-35	1.45-1.70	0.2-0.6	0.14-0.16	7.4-8.4	Moderate-----	0.37			
435B:											
Skeel-----------	0-8	0-15	1.35-1.65	2.0-6.0	0.10-0.12	5.6-6.0	Low----------	0.17	2	2	.5-2
	8-11	0-10	1.30-1.70	6.0-20	0.07-0.09	5.6-6.5	Low----------	0.15			
	11-29	0-10	1.70-2.00	6.0-20	0.01-0.02	5.6-6.0	Low----------	0.15			
	29-36	0-10	1.30-1.70	6.0-20	0.06-0.08	5.1-6.0	Low----------	0.15			
	36-39	27-40	1.45-1.75	0.2-0.6	0.14-0.16	6.6-7.3	Moderate-----	0.32			
	39-80	27-40	1.45-1.75	0.2-0.6	0.14-0.16	7.4-8.4	Moderate-----	0.32			
Algonquin-------	0-9	40-60	1.40-1.60	0.06-0.2	0.11-0.14	7.4-8.4	High---------	0.32	3	4	2-4
	9-13	40-60	1.60-1.75	0.06-0.2	0.09-0.11	7.4-8.4	High---------	0.28			
	13-17	40-60	1.60-1.75	0.00-0.06	0.09-0.11	7.4-8.4	High---------	0.28			
	17-80	40-60	1.60-1.75	0.00-0.06	0.08-0.11	7.4-8.4	High---------	0.28			
Aquepts---------	0-80	---	---	---	---	4.5-7.3	-------------	----	5	---	---
436A:											
Manary----------	0-11	27-40	1.10-1.35	0.06-0.2	0.21-0.23	7.4-8.4	High---------	0.32	5	4	1-4
	11-18	35-55	1.40-1.65	0.06-0.2	0.11-0.20	6.6-8.4	High---------	0.32			
	18-29	35-60	1.50-1.75	0.06-0.2	0.11-0.13	6.6-9.0	High---------	0.28			
	29-80	8-45	1.50-1.75	0.06-0.6	0.08-0.10	7.4-8.4	Moderate-----	0.32			
Whittemore------	0-12	0-10	1.20-1.50	6.0-20	0.07-0.09	5.1-6.0	Low----------	0.15	2	1	1-3
	12-17	0-10	1.75-2.00	2.0-6.0	0.01-0.02	5.6-6.0	Low----------	0.15			
	17-35	5-12	1.40-1.60	2.0-20	0.01-0.03	5.6-7.8	Low----------	0.15			
	35-44	40-60	1.45-1.70	0.06-0.06	0.11-0.12	7.9-8.4	High---------	0.32			
	44-80	40-60	1.65-1.80	0.01-0.06	0.11-0.12	7.9-8.4	High---------	0.32			
Springport------	0-10	35-60	1.10-1.35	0.2-0.6	0.17-0.19	6.6-7.8	High---------	0.32	5	4	2-5
	10-36	40-60	1.40-1.65	0.06-0.2	0.11-0.20	7.4-8.4	High---------	0.32			
	36-50	35-60	1.40-1.70	0.01-0.06	0.11-0.20	7.4-8.4	High---------	0.32			
	50-80	35-65	1.40-1.70	0.01-0.06	0.11-0.20	7.4-8.4	High---------	0.32			
437D:											
Wurtsmith-------	0-4	0-5	1.30-1.55	6.0-20	0.06-0.09	3.6-6.0	Low----------	0.15	5	1	.5-2
	4-24	0-5	1.40-1.60	6.0-20	0.06-0.08	3.6-6.0	Low----------	0.15			
	24-80	0-5	1.50-1.65	6.0-20	0.05-0.07	3.6-7.3	Low----------	0.15			
Meehan----------	0-2	1-4	1.35-1.65	6.0-20	0.07-0.09	3.5-7.3	Low----------	0.15	5	1	.5-3
	2-43	4-9	1.60-1.70	6.0-20	0.06-0.11	3.5-6.5	Low----------	0.15			
	43-80	1-4	1.60-1.70	6.0-20	0.02-0.07	3.5-7.3	Low----------	0.15			
Deer Park-------	0-6	0-10	1.30-1.55	6.0-20	0.04-0.07	3.5-6.0	Low----------	0.15	5	1	.5-1
	6-18	0-10	1.40-1.60	6.0-20	0.03-0.06	3.5-6.5	Low----------	0.15			
	18-80	0-10	1.40-1.55	6.0-20	0.03-0.05	3.5-6.5	Low----------	0.15			
438C:											
Meehan----------	0-2	1-4	1.35-1.65	6.0-20	0.07-0.09	3.5-7.3	Low----------	0.15	5	1	.5-3
	2-43	4-9	1.60-1.70	6.0-20	0.06-0.11	3.5-6.5	Low----------	0.15			
	43-80	1-4	1.60-1.70	6.0-20	0.02-0.07	3.5-7.3	Low----------	0.15			
Tawas-----------	0-24	---	0.30-0.55	0.2-6.0	0.35-0.45	4.5-7.8	-------------	----	2	2	40-60
	24-80	0-10	1.40-1.65	6.0-20	0.03-0.10	5.6-8.4	Low----------	0.15			

Table 18.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
438C:											
Wurtsmith-------	0-4	0-5	1.30-1.55	6.0-20	0.06-0.09	3.6-6.0	Low----------	0.15	5	1	.5-2
	4-24	0-5	1.40-1.60	6.0-20	0.06-0.08	3.6-6.0	Low----------	0.15			
	24-80	0-5	1.50-1.65	6.0-20	0.05-0.07	3.6-7.3	Low----------	0.15			
439D------------- Deer Park	0-6	0-10	1.30-1.55	6.0-20	0.04-0.07	3.5-6.0	Low----------	0.15	5	1	.5-1
	6-18	0-10	1.40-1.60	6.0-20	0.03-0.06	3.5-6.5	Low----------	0.15			
	18-80	0-10	1.40-1.55	6.0-20	0.03-0.05	3.5-6.5	Low----------	0.15			
440B:											
Kawkawlin-------	0-6	8-27	1.45-1.60	0.6-2.0	0.20-0.22	5.1-7.3	Low----------	0.37	5	3	2-4
	6-18	35-45	1.45-1.60	0.06-0.2	0.10-0.20	5.1-7.8	Moderate-----	0.32			
	18-80	30-40	1.50-1.60	0.06-0.2	0.13-0.20	7.9-8.4	Moderate-----	0.32			
Sims------------	0-5	18-27	1.35-1.55	0.6-2.0	0.20-0.22	6.1-7.8	Low----------	0.24	5	5	3-10
	5-47	35-45	1.40-1.70	0.06-0.2	0.12-0.20	6.1-7.8	Moderate-----	0.37			
	47-80	35-40	1.40-1.65	0.06-0.2	0.10-0.18	7.4-8.4	Moderate-----	0.37			
441B, 441C:											
Morganlake------	0-4	1-10	1.30-1.55	6.0-20	0.07-0.12	3.5-7.3	Low----------	0.15	5	1	.5-1
	4-23	1-10	1.40-1.65	6.0-20	0.06-0.08	3.5-6.0	Low----------	0.15			
	23-29	1-10	1.40-1.65	6.0-20	0.09-0.11	3.5-6.0	Low----------	0.15			
	29-47	27-35	1.45-1.70	0.2-0.6	0.14-0.16	5.6-7.8	Moderate-----	0.37			
	47-80	27-35	1.45-1.70	0.2-0.6	0.14-0.16	7.4-8.4	Moderate-----	0.37			
Nester----------	0-11	5-20	1.25-1.60	2.0-6.0	0.13-0.15	5.1-7.3	Low----------	0.20	5	3	1-3
	11-17	5-25	1.25-1.60	0.6-2.0	0.15-0.22	5.1-7.3	Low----------	0.28			
	17-34	35-45	1.40-1.60	0.06-0.2	0.08-0.17	5.1-8.4	Moderate-----	0.28			
	34-80	30-40	1.40-1.65	0.06-0.2	0.10-0.17	7.9-8.4	Moderate-----	0.32			
442D:											
Menominee-------	0-7	0-10	1.35-1.55	6.0-20	0.08-0.10	3.5-6.5	Low----------	0.15	5	1	.5-2
	7-23	5-15	1.45-1.70	6.0-20	0.04-0.10	4.5-7.8	Low----------	0.15			
	23-59	18-35	1.45-1.70	0.2-0.6	0.14-0.18	5.1-7.8	Moderate-----	0.28			
	59-80	12-35	1.45-1.75	0.2-0.6	0.13-0.18	6.6-8.4	Moderate-----	0.32			
Curtisville-----	0-5	10-20	1.35-1.55	2.0-6.0	0.13-0.15	5.1-6.5	Low----------	0.24	5	3	1-3
	5-16	15-30	1.40-1.70	0.6-2.0	0.15-0.19	4.5-6.5	Low----------	0.32			
	16-29	35-45	1.40-1.70	0.06-0.2	0.09-0.19	5.6-7.3	Moderate-----	0.32			
	29-80	30-40	1.45-1.65	0.06-0.2	0.10-0.17	7.4-8.4	Moderate-----	0.32			
442E:											
Menominee-------	0-7	0-10	1.35-1.55	6.0-20	0.08-0.10	3.5-6.5	Low----------	0.15	5	1	.5-2
	7-23	5-15	1.45-1.70	6.0-20	0.04-0.10	4.5-7.8	Low----------	0.15			
	23-54	18-35	1.45-1.70	0.2-0.6	0.14-0.18	5.1-7.8	Moderate-----	0.28			
	54-80	12-35	1.45-1.75	0.2-0.6	0.13-0.18	6.6-8.4	Moderate-----	0.32			
Curtisville-----	0-5	10-20	1.35-1.55	2.0-6.0	0.13-0.15	5.1-6.5	Low----------	0.24	5	3	1-3
	5-16	15-30	1.40-1.70	0.6-2.0	0.15-0.19	4.5-6.5	Low----------	0.32			
	16-29	35-45	1.40-1.70	0.06-0.2	0.09-0.19	5.6-7.3	Moderate-----	0.32			
	29-80	30-40	1.45-1.65	0.06-0.2	0.10-0.17	7.4-8.4	Moderate-----	0.32			
443B:											
Kawkawlin-------	0-13	5-20	1.45-1.60	2.0-6.0	0.12-0.15	5.1-7.3	Low----------	0.24	5	3	2-4
	13-37	35-45	1.45-1.60	0.06-0.2	0.10-0.20	5.1-7.8	Moderate-----	0.32			
	37-80	30-40	1.50-1.60	0.06-0.2	0.13-0.20	7.9-8.4	Moderate-----	0.32			

Table 18.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
443B:											
Allendale-------	0-6	0-12	1.25-1.40	6.0-20	0.09-0.12	4.5-7.3	Low----------	0.17	4	2	2-4
	6-32	0-15	1.35-1.45	6.0-20	0.06-0.10	4.5-7.3	Low----------	0.17			
	32-80	40-60	1.45-1.70	0.01-0.06	0.08-0.12	6.1-8.4	High---------	0.32			
Aquepts---------	0-80	---	---	---	---	4.5-7.3	-------------	----	5	---	---
444B------------- Kawkawlin	0-13	5-20	1.45-1.60	2.0-6.0	0.12-0.15	5.1-7.3	Low----------	0.24	5	3	2-4
	13-37	35-45	1.45-1.60	0.06-0.2	0.10-0.20	5.1-7.8	Moderate-----	0.32			
	37-80	30-40	1.50-1.60	0.06-0.2	0.13-0.20	7.9-8.4	Moderate-----	0.32			
445A------------- Corsair	0-8	10-20	1.35-1.55	0.6-2.0	0.20-0.22	6.6-7.3	Low----------	0.32	5	3	2-3
	8-10	2-8	1.45-1.70	2.0-6.0	0.05-0.08	6.6-7.3	Low----------	0.17			
	10-15	10-18	1.30-1.70	0.6-2.0	0.12-0.17	6.6-7.3	Low----------	0.17			
	15-80	5-12	1.55-1.75	2.0-6.0	0.01-0.22	7.4-8.4	Low----------	0.15			
446B:											
Wurtsmith-------	0-4	0-5	1.30-1.55	6.0-20	0.06-0.09	3.6-6.0	Low----------	0.15	5	1	.5-2
	4-24	0-5	1.40-1.60	6.0-20	0.06-0.08	3.6-6.0	Low----------	0.15			
	24-80	0-5	1.50-1.65	6.0-20	0.05-0.07	3.6-7.3	Low----------	0.15			
Meehan----------	0-2	1-4	1.35-1.65	6.0-20	0.07-0.09	3.5-7.3	Low----------	0.15	5	1	.5-3
	2-43	4-9	1.60-1.70	6.0-20	0.06-0.11	3.5-6.5	Low----------	0.15			
	43-80	1-4	1.60-1.70	6.0-20	0.02-0.07	3.5-7.3	Low----------	0.15			
Urban land.											
447A------------- Whittemore	0-12	0-10	1.20-1.50	6.0-20	0.07-0.09	5.1-6.0	Low----------	0.15	2	1	1-3
	12-17	0-10	1.75-2.00	2.0-6.0	0.01-0.02	5.6-6.0	Low----------	0.15			
	17-35	5-12	1.40-1.60	2.0-20	0.01-0.03	5.6-7.8	Low----------	0.15			
	35-44	40-60	1.45-1.70	0.06-0.06	0.11-0.12	7.9-8.4	High---------	0.32			
	44-80	40-60	1.65-1.80	0.00-0.06	0.11-0.12	7.9-8.4	High---------	0.32			
448A:											
Meehan----------	0-2	1-4	1.35-1.65	6.0-20	0.07-0.09	3.5-7.3	Low----------	0.15	5	1	.5-3
	2-43	4-9	1.60-1.70	6.0-20	0.06-0.11	3.5-6.5	Low----------	0.15			
	43-80	1-4	1.60-1.70	6.0-20	0.02-0.07	3.5-7.3	Low----------	0.15			
Tawas-----------	0-24	---	0.30-0.55	0.2-6.0	0.35-0.45	4.5-7.8	-------------	----	2	2	40-60
	24-80	0-10	1.40-1.65	6.0-20	0.03-0.10	5.6-8.4	Low----------	0.15			
449A------------- Kokosing	0-9	0-10	1.20-1.50	6.0-20	0.07-0.09	5.1-7.3	Low----------	0.15	5	1	1-3
	9-27	0-10	1.40-1.65	6.0-20	0.06-0.08	5.1-7.3	Low----------	0.15			
	27-53	25-35	1.45-1.70	0.2-0.6	0.17-0.19	5.1-7.3	Moderate-----	0.28			
	53-80	25-35	1.65-1.80	0.2-0.6	0.14-0.19	7.4-8.4	Moderate-----	0.32			

Table 19.--Water Features

(See text for definitions of terms used in this table. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
12B:							
Tawas	A/D	None	---	---	+1-1.0	Apparent	Oct-May
Au Gres	B	None	---	---	0.5-1.5	Apparent	Oct-May
13:							
Tawas	A/D	None	---	---	+1-1.0	Apparent	Oct-May
Lupton	A/D	None	---	---	+1-1.0	Apparent	Oct-May
15A:							
Croswell	A	None	---	---	2.0-3.5	Apparent	Nov-May
Au Gres	B	None	---	---	0.5-1.5	Apparent	Oct-May
16B, 16D Graycalm	A	None	---	---	>6.0	---	---
17B Croswell	A	None	---	---	2.0-3.5	Apparent	Nov-May
18A Au Gres	B	None	---	---	0.5-1.5	Apparent	Oct-May
19 Leafriver	A/D	None	---	---	+1-1.0	Apparent	Nov-Jul
25B, 25C Kent	D	None	---	---	2.0-3.5	Perched	Nov-May
26B Cublake	A	None	---	---	2.0-3.5	Perched	Oct-May
27A Tacoda	C	None	---	---	0.5-1.5	Perched	Oct-May
28B East Lake	A	None	---	---	>6.0	---	---
39B, 39C Glennie	C	None	---	---	2.5-3.5	Perched	Nov-May
40A Sprinkler	C	None	---	---	0.5-1.5	Apparent	Oct-May
47D, 47F Graycalm	A	None	---	---	>6.0	---	---
53B, 53C Negwegon	C	None	---	---	2.0-3.5	Perched	Nov-May
54A Algonquin	D	None	---	---	0.5-1.5	Perched	Oct-May
55 Springport	D	None	---	---	+1-1.0	Perched	Oct-Jun

Table 19.--Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
56C-------------------- Nester	C	None------------	---	---	2.5-3.5	Perched-----	Nov-May
57B-------------------- Kawkawlin	C	None------------	---	---	0.5-1.5	Perched-----	Oct-May
58A:							
Wakeley----------------	D	None------------	---	---	+1-1.0	Perched-----	Oct-May
Allendale--------------	C	None------------	---	---	0.5-1.5	Perched-----	Oct-May
59B:							
Algonquin--------------	D	None------------	---	---	0.5-1.5	Perched-----	Oct-May
Springport-------------	D	None------------	---	---	+1-1.0	Perched-----	Oct-Jun
62A-------------------- Allendale	C	None------------	---	---	0.5-1.5	Perched-----	Oct-May
70--------------------- Lupton	A/D	None------------	---	---	+1-1.0	Apparent----	Oct-May
71--------------------- Tawas	A/D	None------------	---	---	+1-1.0	Apparent----	Oct-May
72--------------------- Dorval	A/D	None------------	---	---	+1-1.0	Perched-----	Nov-May
75B, 75D, 75E, 75F------ Rubicon	A	None------------	---	---	>6.0	---	---
77--------------------- Rollaway	D	Frequent--------	Brief to very long.	Mar-May	+2-1.0	Apparent----	Jan-Dec
78. Pits							
81B, 81D, 81E----------- Grayling	A	None------------	---	---	>6.0	---	---
82C, 82F---------------- Udorthents	---	None------------	---	---	>6.0	---	---
83B-------------------- Udipsamments	A	None------------	---	---	>6.0	---	---
84B-------------------- Zimmerman	A	None------------	---	---	>6.0	---	---
86:							
Histosols--------------	D	None------------	---	---	+1-0.0	Apparent----	Jan-Dec
Aquents----------------	D	None------------	---	---	+1-0.0	Apparent----	Jan-Dec
93B:							
Tacoda-----------------	C	None------------	---	---	0.5-1.5	Perched-----	Oct-May
Wakeley----------------	D	None------------	---	---	+1-1.0	Perched-----	Oct-May

Table 19.--Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months
					Ft		
97------------------ Colonville	C	Occasional------	Brief---------	Dec-May	0.5-1.5	Apparent----	Oct-May
100D, 100E-------------- Curtisville	D	None------------	---	---	>6.0	---	---
103B, 103C-------------- Nester	C	None------------	---	---	2.5-3.5	Perched-----	Nov-May
108B-------------------- Selkirk	C	None------------	---	---	0.5-1.5	Perched-----	Nov-May
114A-------------------- Ingalls	B	None------------	---	---	0.5-1.5	Perched-----	Oct-May
120B, 120C-------------- Morganlake	B	None------------	---	---	2.0-3.5	Perched-----	Oct-May
123D-------------------- Klacking	A	None------------	---	---	>6.0	---	---
124--------------------- Evart	D	Common----------	Brief or long	Nov-Jun	+1-1.0	Apparent----	Jan-Dec
127--------------------- Cathro	A/D	None------------	---	---	+1-1.0	Apparent----	Oct-May
128--------------------- Dawson	A/D	None------------	---	---	+1-1.0	Apparent----	Sep-Jun
130--------------------- Grousehaven	D	None------------	---	---	+1-1.0	Apparent----	Oct-May
159A-------------------- Finch	C	None------------	---	---	0.5-1.5	Apparent----	Oct-May
182. Pits							
197A-------------------- Gladwin	A	None------------	---	---	0.5-1.5	Apparent----	Oct-May
209B, 209C, 209D-------- Grayling	A	None------------	---	---	>15	---	---
210B, 210C, 210D, 210E-- Grayling	A	None------------	---	---	>15	---	---
211B-------------------- Grayling	A	None------------	---	---	>15	---	---
212B-------------------- Grayling	A	None------------	---	---	6.0-15	---	---
213B-------------------- Graycalm	A	None------------	---	---	>15	---	---
214B-------------------- Typic Udipsamments	A	None------------	---	---	3.5-6.0	Apparent----	Oct-May

Table 19.--Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
215B, 216B, 220B, 220D, 220E, 221B, 221C, 221D, 221E------------- Typic Udipsamments	A	None------------	---	---	>15	---	---
222B-------------------- Typic Udipsamments	A	None------------	---	---	5.0-15	Apparent----	Jan-Dec
223B, 223C, 223D, 223E:							
Graycalm--------------	A	None------------	---	---	>15	---	---
Grayling--------------	A	None------------	---	---	>15	---	---
224B-------------------- Croswell	A	None------------	---	---	2.0-3.5	Apparent----	Nov-May
225B, 225C-------------- Entic Haplorthods	A	None------------	---	---	>15	---	---
231D, 231E:							
Entic Haplorthods------	A	None------------	---	---	>15	---	---
Alfic Haplorthods------	A	None------------	---	---	>15	---	---
232B:							
Entic Haplorthods------	A	None------------	---	---	6.0-15	Apparent----	Jan-Dec
Alfic Haplorthods------	A	None------------	---	---	>15	Apparent----	Jan-Dec
233B, 233C, 233D:							
Alfic Haplorthods------	A	None------------	---	---	>15	---	---
Entic Haplorthods------	A	None------------	---	---	>15	---	---
235B, 235C:							
Alfic Haplorthods, sandy over loamy------	A	None------------	---	---	>15	---	---
Alfic Haplorthods, sandy-----------------	A	None------------	---	---	>15	---	---
236B-------------------- Arenic Eutroboralfs	B	None------------	---	---	>6.0	---	---
237B, 237D-------------- Eutroboralfs	---	None------------	---	---	3.5-6.0	Apparent----	Oct-May
254A:							
Borosaprists-----------	---	None------------	---	---	+1-1.0	Apparent----	Sep-Jun
Fluvaquents------------	---	Common----------	Brief---------	Nov-Apr	+1-1.0	Apparent----	Oct-May
Aquic Udipsamments-----	A	Common----------	Brief---------	Oct-May	0.5-1.5	Apparent----	Oct-May
262A-------------------- Au Gres	B	None------------	---	---	0.5-1.5	Apparent----	Oct-May
263A-------------------- Argic Endoaquods	A	None------------	---	---	0.5-1.5	Apparent----	Oct-May

Table 19.--Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
264A-------------------- Allendale	C	None------------	---	---	0.5-1.5	Perched-----	Oct-May
265B:							
Eutroboralfs-----------	---	None------------	---	---	3.5-6.0	Apparent----	Oct-May
Allendale--------------	C	None------------	---	---	0.5-1.5	Perched-----	Oct-May
266A-------------------- Typic Duraquods	C	None------------	---	---	0.5-1.5	Apparent----	Oct-May
272:							
Endoaquods-------------	---	None------------	---	---	+1-1.0	Apparent----	Oct-May
Fluvaquents------------	---	Common----------	Brief---------	Nov-Apr	+1-1.0	Apparent----	Oct-May
273:							
Leafriver--------------	A/D	None------------	---	---	+1-1.0	Apparent----	Nov-Jul
Wakeley----------------	D	None------------	---	---	+1-1.0	Perched-----	Oct-May
274--------------------- Typic Endoaquods	D	None------------	---	---	+1-1.0	Apparent----	Oct-May
280:							
Aquents----------------	D	None------------	---	---	+1-0.0	Apparent----	Jan-Dec
Histosols--------------	D	None------------	---	---	+1-0.0	Apparent----	Jan-Dec
281, 282---------------- Borosaprists	D	None------------	---	---	+1-1.0	Apparent----	Sep-Jun
343--------------------- Sims	D	None------------	---	---	+1-1.0	Perched-----	Oct-May
355E:							
Crowell----------------	A	None------------	---	---	>6.0	---	---
Proper-----------------	A	None------------	---	---	2.0-3.5	Apparent----	Nov-May
356E:							
Aquepts----------------	---	None------------	---	---	0.5-2.5	Perched-----	Oct-May
Histosols--------------	D	None------------	---	---	+1-1.0	Apparent----	Jan-Dec
Fluvaquents------------	D	Common----------	Brief---------	Nov-May	+1-1.0	Apparent----	Nov-May
357B:							
Udipsamments-----------	A	None------------	---	---	>6.0	---	---
Urban land.							
360--------------------- Wakeley	D	None------------	---	---	+1-1.0	Perched-----	Oct-May
367A:							
Whittemore-------------	C/D	None------------	---	---	0.5-1.5	Perched-----	Oct-May
Springport-------------	D	None------------	---	---	+1-1.0	Perched-----	Oct-Jun

Table 19.--Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months
					Ft		
368A:							
Au Gres	B	None	---	---	0.5-1.5	Apparent	Oct-May
Deford	A/D	None	---	---	+1-1.0	Apparent	Oct-May
369 Deford	A/D	None	---	---	+1-1.0	Apparent	Oct-May
370A McIvor	D	None	---	---	0.5-1.5	Perched	Oct-May
371 Springport	D	None	---	---	+1-1.0	Perched	Oct-Jun
372B:							
Proper	A	None	---	---	2.0-3.5	Apparent	Nov-May
Leafriver	A/D	None	---	---	+1-1.0	Apparent	Nov-Jul
375 Kanotin	A/D	None	---	---	+1-1.0	Perched	Oct-May
377 Wabun	A/D	None	---	---	+1-1.0	Perched	Oct-May
378A Algonquin	D	None	---	---	0.5-1.5	Perched	Oct-May
379A:							
Algonquin	D	None	---	---	0.5-1.5	Perched	Oct-May
Springport	D	None	---	---	+1-1.0	Perched	Oct-Jun
380. Access denied							
381A:							
McIvor	D	None	---	---	0.5-1.5	Perched	Oct-May
Wakeley	D	None	---	---	+1-1.0	Perched	Oct-May
382B Proper	A	None	---	---	2.0-3.5	Apparent	Nov-May
383B Wurtsmith	A	None	---	---	2.0-3.5	Apparent	Nov-May
392 Caffey	C	None	---	---	+1-1.0	Apparent	Oct-May
403B, 403C Iargo	C	None	---	---	2.5-3.5	Perched	Nov-May
404A Manary	C	None	---	---	0.5-1.5	Perched	Oct-May
405B:							
Manary	C	None	---	---	0.5-1.5	Perched	Oct-May
Iargo	C	None	---	---	2.5-3.5	Perched	Nov-May

Table 19.--Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
406A-------------------- Winterfield	A/D	Rare------------	---	---	0.5-1.5	Apparent----	Oct-May
407--------------------- Lacota	B/D	None------------	---	---	+1-1.0	Apparent----	Oct-May
408--------------------- Sims	D	None------------	---	---	+1-1.0	Perched-----	Oct-May
409A:							
Finch------------------	C	None------------	---	---	0.5-1.5	Apparent----	Oct-May
Deford-----------------	A/D	None------------	---	---	+1-1.0	Apparent----	Oct-May
Au Gres----------------	B	None------------	---	---	0.5-1.5	Apparent----	Oct-May
410B:							
Proper-----------------	A	None------------	---	---	2.0-3.5	Apparent----	Nov-May
Finch------------------	C	None------------	---	---	0.5-1.5	Apparent----	Oct-May
Deford-----------------	A/D	None------------	---	---	+1-1.0	Apparent----	Oct-May
411A-------------------- Meehan	B	None------------	---	---	1.0-3.0	Apparent----	Oct-Jun
425D-------------------- Hottis	D	None------------	---	---	>6.0	---	---
426B, 426C-------------- Coppler	A	None------------	---	---	>6.0	---	---
427--------------------- Tonkey	B/D	None------------	---	---	+1-1.0	Apparent----	Oct-May
429D-------------------- Menominee	A	None------------	---	---	>6.0	---	---
430D, 430E-------------- Mongo	D	None------------	---	---	>6.0	---	---
431B-------------------- Skeel	B	None------------	---	---	2.0-3.5	Perched-----	Nov-May
432B:							
Wurtsmith--------------	A	None------------	---	---	2.0-3.5	Apparent----	Nov-May
Meehan-----------------	B	None------------	---	---	1.0-3.0	Apparent----	Oct-Jun
433B:							
Morganlake-------------	B	None------------	---	---	2.0-3.5	Perched-----	Oct-May
Graycalm---------------	A	None------------	---	---	>6.0	---	---
434D:							
Graycalm---------------	A	None------------	---	---	>6.0	---	---
Menominee--------------	A	None------------	---	---	>6.0	---	---
Morganlake-------------	B	None------------	---	---	2.0-3.5	Perched-----	Oct-May

Table 19.--Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
435B:							
Skeel	B	None	---	---	2.0-3.5	Perched	Oct-May
Algonquin	D	None	---	---	0.5-1.5	Perched	Oct-May
Aquepts	---	None	---	---	+1-0.0	Perched	Jan-Dec
436A:							
Manary	C	None	---	---	0.5-1.5	Perched	Oct-May
Whittemore	C/D	None	---	---	0.5-1.5	Perched	Oct-May
Springport	D	None	---	---	+1-1.0	Perched	Oct-Jun
437D:							
Wurtsmith	A	None	---	---	2.0-3.5	Apparent	Nov-May
Meehan	B	None	---	---	1.0-3.0	Apparent	Oct-Jun
Deer Park	A	None	---	---	>6.0	---	---
438C:							
Meehan	B	None	---	---	1.0-3.0	Apparent	Oct-Jun
Tawas	A/D	None	---	---	+1-1.0	Apparent	Oct-May
Wurtsmith	A	None	---	---	2.0-3.5	Apparent	Nov-May
439D Deer Park	A	None	---	---	>6.0	---	---
440B:							
Kawkawlin	C	None	---	---	0.5-1.5	Perched	Oct-May
Sims	D	None	---	---	+1-1.0	Perched	Oct-May
441B, 441C:							
Morganlake	B	None	---	---	2.0-3.5	Perched	Oct-May
Nester	C	None	---	---	2.5-3.5	Perched	Nov-May
442D, 442E:							
Menominee	A	None	---	---	>6.0	---	---
Curtisville	D	None	---	---	>6.0	---	---
443B:							
Kawkawlin	C	None	---	---	0.5-1.5	Perched	Oct-May
Allendale	C	None	---	---	0.5-1.5	Perched	Oct-May
Aquepts	---	None	---	---	+1-1.0	Perched	Jan-Dec
444B Kawkawlin	C	None	---	---	0.5-1.5	Perched	Oct-May
445A Corsair	A	None	---	---	1.0-2.0	Perched	Oct-May

Table 19.--Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
446B:							
Wurtsmith	A	None	---	---	2.0-3.5	Apparent	Oct-May
Meehan	B	None	---	---	1.0-3.0	Apparent	Oct-Jun
Urban land.							
447A Whittemore	C/D	None	---	---	0.5-1.5	Perched	Oct-May
448A:							
Meehan	B	None	---	---	1.0-3.0	Apparent	Oct-Jun
Tawas	A/D	None	---	---	+1-1.0	Apparent	Oct-May
449A Kokosing	C	None	---	---	0.5-2.5	Perched	Oct-May

Table 20.--Soil Features

(See text for definitions of terms used in this table. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Bedrock		Subsidence		Potential frost action	Risk of corrosion	
	Depth	Hardness	Initial	Total		Uncoated steel	Concrete
	In		In	In			
12B:							
Tawas	>60	---	4-15	25-30	High	High	Moderate.
Au Gres	>60	---	---	---	Moderate	Low	Moderate.
13:							
Tawas	>60	---	4-15	25-30	High	High	Moderate.
Lupton	>60	---	6-18	50-55	High	High	Low.
15A:							
Croswell	>60	---	---	---	Low	Low	Moderate.
Au Gres	>60	---	---	---	Moderate	Low	Moderate.
16B, 16D Graycalm	>60	---	---	---	Low	Low	Moderate.
17B Croswell	>60	---	---	---	Low	Low	Moderate.
18A Au Gres	>60	---	---	---	Moderate	Low	Moderate.
19 Leafriver	>60	---	---	5-10	High	High	High.
25B, 25C Kent	>60	---	---	---	Moderate	High	Low.
26B Cublake	>60	---	---	---	Low	Low	Moderate.
27A Tacoda	>60	---	---	---	Moderate	Low	Moderate.
28B East Lake	>60	---	---	---	Low	Low	Moderate.
39B, 39C Glennie	>60	---	---	---	Moderate	Moderate	Low.
40A Sprinkler	>60	---	---	---	High	High	Moderate.
47D, 47F Graycalm	>60	---	---	---	Low	Low	Moderate.
53B, 53C Negwegon	>60	---	---	---	Moderate	High	Low.
54A Algonquin	>60	---	---	---	High	High	Low.
55 Springport	>60	---	---	---	High	High	Low.

Table 20.--Soil Features--Continued

Soil name and map symbol	Bedrock		Subsidence		Potential frost action	Risk of corrosion	
	Depth	Hardness	Initial	Total		Uncoated steel	Concrete
	In		In	In			
56C: Nester	>60	---	---	---	Moderate	High	Low.
57B: Kawkawlin	>60	---	---	---	High	High	Low.
58A:							
Wakeley	>60	---	---	---	Moderate	High	Moderate.
Allendale	>60	---	---	---	Moderate	High	Moderate.
59B:							
Algonquin	>60	---	---	---	High	High	Low.
Springport	>60	---	---	---	High	High	Low.
62A: Allendale	>60	---	---	---	Moderate	High	Moderate.
70: Lupton	>60	---	6-18	50-55	High	High	Low.
71: Tawas	>60	---	4-15	25-30	High	High	Moderate.
72: Dorval	>60	---	4-12	25-30	High	High	Moderate.
75B, 75D, 75E, 75F: Rubicon	>60	---	---	---	Low	Low	High.
77: Rollaway	>60	---	---	---	High	Moderate	Low.
78. Pits							
81B, 81D, 81E: Grayling	>60	---	---	---	Low	Low	Moderate.
82C, 82F: Udorthents	>60	---	---	---	---	---	---
83B: Udipsamments	>60	---	---	---	Low	Low	Moderate.
84B: Zimmerman	>60	---	---	---	Low	Low	High.
86:							
Histosols	>60	---	---	---	High	---	---
Aquents	>60	---	---	---	High	---	---
93B:							
Tacoda	>60	---	---	---	Moderate	Low	Moderate.
Wakeley	>60	---	---	---	Moderate	High	Moderate.
97: Colonville	>60	---	---	---	High	Low	Low.

Table 20.--Soil Features--Continued

Soil name and map symbol	Bedrock		Subsidence		Potential frost action	Risk of corrosion	
	Depth	Hardness	Initial	Total		Uncoated steel	Concrete
	In		In	In			
100D, 100E: Curtisville	>80	---	---	---	Moderate	Moderate	Moderate.
103B, 103C: Nester	>60	---	---	---	Moderate	High	Low.
108B: Selkirk	>60	---	---	---	High	High	Low.
114A: Ingalls	>60	---	---	---	Moderate	Moderate	Moderate.
120B, 120C: Morganlake	>60	---	---	---	Low	Low	Moderate.
123D: Klacking	>60	---	---	---	Low	Low	Moderate.
124: Evart	>60	---	---	---	Moderate	High	Low.
127: Cathro	>60	---	4-12	19-22	High	High	Low.
128: Dawson	>60	---	---	30-36	High	High	High.
130: Grousehaven	>60	---	---	---	High	High	Low.
159A: Finch	>60	---	---	---	Moderate	High	Moderate.
182. Pits							
197A: Gladwin	>60	---	---	---	Moderate	Low	Low.
209B, 209C, 209D: Grayling	>60	---	---	---	Low	Low	High.
210B, 210C, 210D, 210E: Grayling	>60	---	---	---	Low	Low	Moderate.
211B: Grayling	>60	---	---	---	Low	Low	High.
212B: Grayling	>60	---	---	---	Low	Low	Moderate.
213B: Graycalm	>60	---	---	---	Low	Low	Moderate.
214B, 215B, 216B, 220B, 220D, 220E, 221B, 221C, 221D, 221E, 222B: Typic Udipsamments	>60	---	---	---	Low	Low	High.

Table 20.--Soil Features--Continued

Soil name and map symbol	Bedrock: Depth	Bedrock: Hardness	Subsidence: Initial	Subsidence: Total	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
	In		In	In			
223B, 223C, 223D, 223E:							
Graycalm	>60	---	---	---	Low	Low	Moderate.
Grayling	>60	---	---	---	Low	Low	Moderate.
224B Croswell	>60	---	---	---	Low	Low	Moderate.
225B, 225C Entic Haplorthods	>60	---	---	---	Low	Low	High.
231D, 231E, 232B:							
Entic Haplorthods	>60	---	---	---	Low	Low	High.
Alfic Haplorthods	>60	---	---	---	Low	Low	High.
233B, 233C, 233D:							
Alfic Haplorthods	>60	---	---	---	Low	Low	High.
Entic Haplorthods	>60	---	---	---	Low	Low	High.
235B, 235C:							
Alfic Haplorthods, sandy over loamy	>60	---	---	---	Low	Low	Moderate.
Alfic Haplorthods, sandy	>60	---	---	---	Low	Low	High.
236B Arenic Eutroboralfs	>60	---	---	---	Moderate	Low	Moderate.
237B, 237D Eutroboralfs	>60	---	---	---	---	---	---
254A:							
Borosaprists.							
Fluvaquents	>60	---	---	---	---	---	---
Aquic Udipsamments	>60	---	---	---	Moderate	Low	High.
262A Au Gres	>60	---	---	---	Moderate	Low	Moderate.
263A Argic Endoaquods	>60	---	---	---	Moderate	---	---
264A Allendale	>60	---	---	---	Moderate	High	Moderate.
265B:							
Eutroboralfs	>60	---	---	---	---	---	---
Allendale	>60	---	---	---	Moderate	High	Moderate.
266A Typic Duraquods	>60	---	---	---	Moderate	Moderate	High.

Table 20.--Soil Features--Continued

Soil name and map symbol	Bedrock		Subsidence		Potential frost action	Risk of corrosion	
	Depth	Hardness	Initial	Total		Uncoated steel	Concrete
	In		In	In			
272:							
Endoaquods	>60	---	---	---	---	---	---
Fluvaquents	>60	---	---	---	---	---	---
273:							
Leafriver	>60	---	---	5-10	High	High	High.
Wakeley	>60	---	---	---	Moderate	High	Moderate.
274 Typic Endoaquods	>60	---	---	---	Moderate	---	---
280:							
Aquents	>60	---	---	---	High	---	---
Histosols	>60	---	---	---	High	---	---
281 Borosaprists	>60	---	---	---	High	High	High.
282 Borosaprists	>60	---	---	---	High	High	Moderate.
343 Sims	>60	---	---	---	High	High	Low.
355E:							
Crowell	>60	---	---	---	Low	Low	High.
Proper	>80	---	---	---	Low	Low	Moderate.
356E:							
Aquepts	>80	---	---	---	---	---	---
Histosols	>60	---	---	---	High	---	---
Fluvaquents	>60	---	---	---	High	---	---
357B:							
Udipsamments	>60	---	---	---	Low	Low	Moderate.
Urban land.							
360 Wakeley	>60	---	---	---	Moderate	High	Moderate.
367A:							
Whittemore	>60	---	---	---	Moderate	High	Low.
Springport	>60	---	---	---	High	High	Low.
368A:							
Au Gres	>60	---	---	---	Moderate	Low	Moderate.
Deford	>60	---	---	---	Moderate	Low	Moderate.
369 Deford	>60	---	---	---	Moderate	Low	Moderate.

Table 20.--Soil Features--Continued

Soil name and map symbol	Bedrock: Depth	Bedrock: Hardness	Subsidence: Initial	Subsidence: Total	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
	In		In	In			
370A------ McIvor	>60	---	---	---	Moderate	Low	Moderate.
371------ Springport	>60	---	---	---	High	High	Low.
372B:							
Proper------	>80	---	---	---	Low	Low	Moderate.
Leafriver------	>60	---	---	5-10	High	High	High.
375------ Kanotin	>60	---	---	---	Moderate	High	High.
377------ Wabun	>60	---	---	---	Moderate	High	Moderate.
378A------ Algonquin	>60	---	---	---	High	High	Low.
379A:							
Algonquin------	>60	---	---	---	High	High	Low.
Springport------	>60	---	---	---	High	High	Low.
380. Access denied							
381A:							
McIvor------	>60	---	---	---	Moderate	Low	Moderate.
Wakeley------	>60	---	---	---	Moderate	High	Moderate.
382B------ Proper	>80	---	---	---	Low	Low	Moderate.
383B------ Wurtsmith	>60	---	---	---	Low	Low	Moderate.
392------ Caffey	>60	---	---	---	Moderate	High	Low.
403B, 403C------ Iargo	>60	---	---	---	High	High	Low.
404A------ Manary	>60	---	---	---	High	High	Low.
405B:							
Manary------	>60	---	---	---	High	High	Low.
Iargo------	>60	---	---	---	High	High	Low.
406A------ Winterfield	>80	---	---	---	Moderate	Low	Low.
407------ Lacota	>80	---	---	---	High	High	Low.
408------ Sims	>60	---	---	---	High	High	Low.

Table 20.--Soil Features--Continued

Soil name and map symbol	Bedrock		Subsidence		Potential frost action	Risk of corrosion	
	Depth	Hardness	Initial	Total		Uncoated steel	Concrete
	In		In	In			
409A:							
Finch	>60	---	---	---	Moderate	High	Moderate.
Deford	>60	---	---	---	Moderate	Low	Moderate.
Au Gres	>60	---	---	---	Moderate	Low	Moderate.
410B:							
Proper	>80	---	---	---	Low	Low	Moderate.
Finch	>60	---	---	---	Moderate	High	Moderate.
Deford	>60	---	---	---	Moderate	Low	Moderate.
411A Meehan	>60	---	---	---	Moderate	Low	Moderate.
425D Hottis	>80	---	---	---	High	High	Low.
426B, 426C Coppler	>60	---	---	---	Low	Low	Low.
427 Tonkey	>60	---	---	---	High	High	Low.
429D Menominee	>80	---	---	---	Low	Low	Moderate.
430D, 430E Mongo	>60	---	---	---	Moderate	High	Low.
431B Skeel	>60	---	---	---	Low	Moderate	Moderate.
432B:							
Wurtsmith	>60	---	---	---	Low	Low	Moderate.
Meehan	>60	---	---	---	Moderate	Low	Moderate.
433B:							
Morganlake	>60	---	---	---	Low	Low	Moderate.
Graycalm	>60	---	---	---	Low	Low	Moderate.
434D:							
Graycalm	>60	---	---	---	Low	Low	Moderate.
Menominee	>80	---	---	---	Low	Low	Moderate.
Morganlake	>60	---	---	---	Low	Low	Moderate.
435B:							
Skeel	>60	---	---	---	Low	Moderate	Moderate.
Algonquin	>60	---	---	---	High	High	Low.
Aquepts	>80	---	---	---	---	---	---

Table 20.--Soil Features--Continued

Soil name and map symbol	Bedrock		Subsidence		Potential frost action	Risk of corrosion	
	Depth	Hardness	Initial	Total		Uncoated steel	Concrete
	In		In	In			
436A:							
Manary	>60	---	---	---	High	High	Low.
Whittemore	>60	---	---	---	Moderate	High	Low.
Springport	>60	---	---	---	High	High	Low.
437D:							
Wurtsmith	>60	---	---	---	Low	Low	Moderate.
Meehan	>60	---	---	---	Moderate	Low	Moderate.
Deer Park	>60	---	---	---	Low	Low	Low.
438C:							
Meehan	>60	---	---	---	Moderate	Low	Moderate.
Tawas	>60	---	4-15	25-30	High	High	Moderate.
Wurtsmith	>60	---	---	---	Low	Low	Moderate.
439D Deer Park	>60	---	---	---	Low	Low	Low.
440B:							
Kawkawlin	>60	---	---	---	High	High	Low.
Sims	>60	---	---	---	High	High	Low.
441B, 441C:							
Morganlake	>60	---	---	---	Low	Low	Moderate.
Nester	>60	---	---	---	Moderate	High	Low.
442D, 442E:							
Menominee	>80	---	---	---	Low	Low	Moderate.
Curtisville	>80	---	---	---	Moderate	Moderate	Moderate.
443B:							
Kawkawlin	>60	---	---	---	High	High	Low.
Allendale	>60	---	---	---	Moderate	High	Moderate.
Aquepts	>80	---	---	---	---	---	---
444B Kawkawlin	>60	---	---	---	High	High	Low.
445A Corsair	>60	---	---	---	Moderate	Moderate	Low.
446B:							
Wurtsmith	>60	---	---	---	Low	Low	Moderate.
Meehan	>60	---	---	---	Moderate	Low	Moderate.
Urban land.							
447A Whittemore	>60	---	---	---	Moderate	High	Low.

Table 20.--Soil Features--Continued

Soil name and map symbol	Bedrock		Subsidence		Potential frost action	Risk of corrosion	
	Depth	Hardness	Initial	Total		Uncoated steel	Concrete
	In		In	In			
448A:							
Meehan------------------	>60	---	---	---	Moderate-------	Low------------	Moderate.
Tawas-------------------	>60	---	4-15	25-30	High-----------	High-----------	Moderate.
449A-------------------- Kokosing	>80	---	---	---	Moderate-------	Moderate-------	Moderate.

Table 21.--Classification of the Soils

(An asterisk in the first column indicates a taxadjunct to the series. See text for a description of those characteristics that are outside the range of the series)

Soil name	Family or higher taxonomic class
Alfic Haplorthods, sandy	Sandy, mixed, frigid Alfic Haplorthods
Alfic Haplorthods, sandy over loamy	Sandy over loamy, mixed, frigid Alfic Haplorthods
Algonquin	Fine, mixed Aquic Eutroboralfs
Allendale	Sandy over clayey, mixed, frigid Alfic Epiaquods
Aquents	Aquents
Aquepts	Aquepts
Aquic Udipsamments	Mixed, frigid Aquic Udipsamments
Arenic Eutroboralfs	Loamy, mixed Arenic Eutroboralfs
Argic Endoaquods	Mixed, frigid Argic Endoaquods
Au Gres	Sandy, mixed, frigid Typic Endoaquods
Borosaprists	Borosaprists
Caffey	Sandy over loamy, mixed, nonacid, frigid Aeric Endoaquents
Cathro	Loamy, mixed, euic Terric Borosaprists
Colonville	Coarse-loamy, mixed (calcareous), frigid Fluvaquentic Endoaquolls
Coppler	Loamy-skeletal, mixed Arenic Eutroboralfs
Corsair	Coarse-loamy, mixed Aquic Argiborolls
Croswell	Sandy, mixed, frigid Oxyaquic Haplorthods
Crowell	Sandy, mixed, frigid, ortstein Entic Haplorthods
Cublake	Sandy, mixed, frigid Oxyaquic Haplorthods
Curtisville	Fine, mixed Glossic Eutroboralfs
Dawson	Sandy or sandy-skeletal, mixed, dysic Terric Borosaprists
Deer Park	Mixed, frigid Spodic Udipsamments
Deford	Mixed, frigid Typic Psammaquents
Dorval	Clayey, mixed, euic Terric Borosaprists
East Lake	Sandy, mixed, frigid Entic Haplorthods
Endoaquods	Mixed, frigid Endoaquods
Entic Haplorthods	Sandy, mixed, frigid Entic Haplorthods
Eutroboralfs	Eutroboralfs
Evart	Sandy, mixed, frigid Fluvaquentic Endoaquolls
Finch	Sandy, mixed, frigid, ortstein Typic Duraquods
Fluvaquents	Fluvaquents
*Gladwin	Sandy, mixed, frigid Argic Endoaquods
Glennie	Coarse-loamy, mixed Oxyaquic Fragiboralfs
Graycalm	Mixed, frigid Argic Udipsamments
Grayling	Mixed, frigid Typic Udipsamments
Grousehaven	Fine-silty, carbonatic, frigid Histic Humaquepts
Histosols	Histosols
Hottis	Fine, mixed Glossic Eutroboralfs
Iargo	Fine, mixed Oxyaquic Eutroboralfs
Ingalls	Sandy over loamy, mixed, frigid Typic Endoaquods
Kanotin	Sandy, mixed, frigid Histic Epiaquods
Kawkawlin	Fine, mixed Glossaquic Eutroboralfs
Kent	Fine, mixed Oxyaquic Eutroboralfs
Klacking	Coarse-loamy, mixed Psammentic Eutroboralfs
Kokosing	Loamy, mixed Aquic Arenic Eutroboralfs
Lacota	Fine-loamy over sandy or sandy-skeletal, mixed, frigid Typic Endoaquolls
Leafriver	Sandy, mixed, frigid Histic Humaquepts
Lupton	Euic Typic Borosaprists
Manary	Fine, mixed Aquic Argiborolls
McIvor	Sandy, mixed, frigid, ortstein Typic Duraquods
Meehan	Mixed, frigid Aquic Udipsamments
Menominee	Sandy over loamy, mixed, frigid Alfic Haplorthods
Mongo	Fine, mixed Glossic Eutroboralfs
Morganlake	Sandy over loamy, mixed, frigid Oxyaquic Haplorthods
Negwegon	Fine, mixed Oxyaquic Eutroboralfs
Nester	Fine, mixed Oxyaquic Eutroboralfs
Proper	Sandy, mixed, frigid, ortstein Oxyaquic Haplorthods
Rollaway	Coarse-loamy, mixed, nonacid, frigid Histic Humaquepts

Table 21.--Classification of the Soils--Continued

Soil name	Family or higher taxonomic class
Rubicon	Sandy, mixed, frigid Entic Haplorthods
Selkirk	Fine, mixed Glossaquic Eutroboralfs
Sims	Fine, mixed, nonacid, frigid Mollic Epiaquepts
Skeel	Sandy over loamy, mixed, frigid, ortstein Oxyaquic Haplorthods
Springport	Fine, mixed, frigid Typic Epiaquolls
Sprinkler	Fine-loamy, mixed Aquic Glossoboralfs
Tacoda	Sandy, mixed, frigid Typic Epiaquods
Tawas	Sandy or sandy-skeletal, mixed, euic Terric Borosaprists
*Tonkey	Coarse-loamy, mixed, nonacid, frigid Mollic Endoaquepts
Typic Duraquods	Sandy, mixed, frigid, ortstein Typic Duraquods
Typic Endoaquods	Mixed, frigid Typic Endoaquods
Typic Udipsamments	Mixed, frigid Typic Udipsamments
Udipsamments	Udipsamments
Udorthents	Udorthents
Wabun	Mixed, frigid Mollic Psammaquents
Wakeley	Sandy over clayey, mixed, nonacid, frigid Aeric Epiaquents
Whittemore	Sandy over clayey, mixed, frigid, ortstein Typic Duraquods
Winterfield	Mixed, frigid Aquic Udipsamments
Wurtsmith	Mixed, frigid Oxyaquic Udipsamments
Zimmerman	Mixed, frigid Argic Udipsamments

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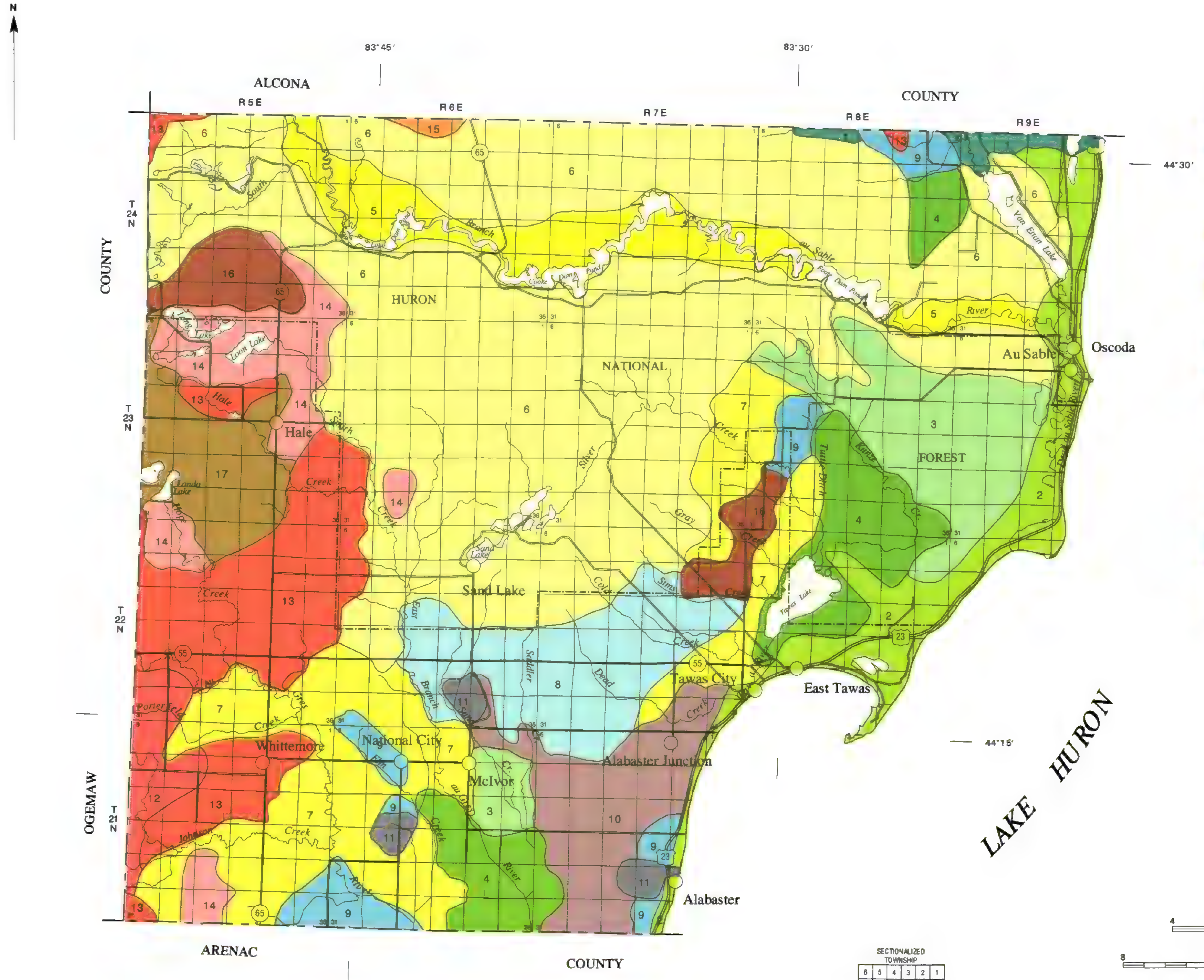


SOIL LEGEND*

SOILS ON WAVE-BUILT TERRACES, BEACH RIDGES, AND DUNES

1 Au Gres-Tawas-Wurtsmith association
2 Deer Park-Meehan-Wurtsmith association
3 Finch-Deford-Proper association
4 Deford-Tawas-Lupton association

SOILS ON OUTWASH PLAINS, STREAM TERRACES, AND DELTAS

5 Borosaprists-Typic Udipsamments-Croswell association
6 Grayling association
7 Au Gres-Croswell-Rubicon association

SOILS ON LAKE PLAINS

8 Manary-Whittemore-Iargo association
9 Algonquin-Allendale-Springport association
10 McIvor-Wakeley association
11 Udorthents association

SOILS ON TILL PLAINS AND MORAINES

12 Selkirk-Kent association
13 Kawkawlin-Nester association
14 Morganlake-Nester association
15 Glennie-Sprinkler association
16 Kawkawlin-Allendale-Nester association
17 Kawkawlin-Sims association

*The units on this legend are described in the text under the heading "General Soil Map Units."

Compiled 1995

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
UNITED STATES FOREST SERVICE
MICHIGAN DEPARTMENT OF AGRICULTURE
MICHIGAN AGRICULTURAL EXPERIMENT STATION
MICHIGAN STATE UNIVERSITY EXTENSION
MICHIGAN TECHNOLOGICAL UNIVERSITY

GENERAL SOIL MAP
IOSCO COUNTY, MICHIGAN

Scale 1:200000

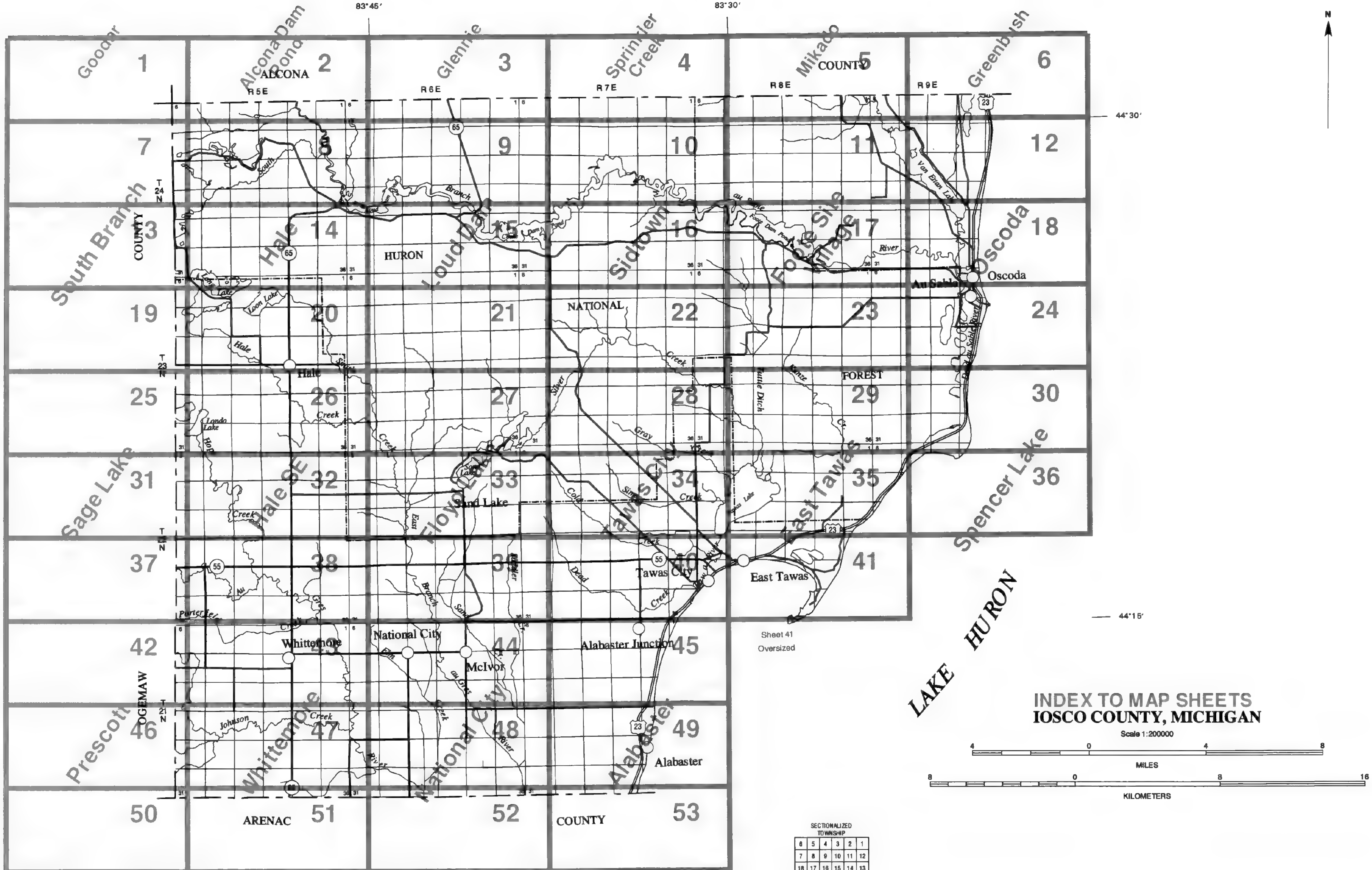
4 0 4 8
MILES

8 0 8 16
KILOMETERS

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



INDEX TO MAP SHEETS
IOSCO COUNTY, MICHIGAN

Scale 1:200000

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

SOIL LEGEND

Map symbols consist of numbers or a combination of numbers and letters. The initial numbers represent the kind of soil. A capital letter following these numbers indicates the class of slope. Symbols without a slope letter are for nearly level, poorly drained and very poorly drained soils or for miscellaneous areas.

SYMBOL	NAME
12B	Tawas-Au Gres complex, 0 to 4 percent slopes
13	Tawas-Lupton mucks
15A	Croswell-Au Gres sands, 0 to 3 percent slopes
16B	Graycalm sand, 0 to 6 percent slopes
16D	Graycalm sand, 12 to 18 percent slopes
17B	Croswell sand, 0 to 6 percent slopes
18A	Au Gres sand, 0 to 3 percent slopes
19	Leafriver muck
25B	Kent sandy loam, 2 to 6 percent slopes
25C	Kent sandy loam, 6 to 12 percent slopes
26B	Cublake sand, 0 to 6 percent slopes
27A	Tacoda sand, 0 to 3 percent slopes
28B	East Lake sand, 0 to 6 percent slopes
39B	Glennie loamy sand, 0 to 6 percent slopes
39C	Glennie loamy sand, 6 to 12 percent slopes
40A	Sprinkler sandy loam, 0 to 3 percent slopes
47D	Graycalm sand, 6 to 18 percent slopes
47F	Graycalm sand, 18 to 45 percent slopes
53B	Negwegon silt loam, 2 to 6 percent slopes
53C	Negwegon silt loam, 6 to 12 percent slopes
54A	Algonquin silt loam, 0 to 3 percent slopes
55	Springport clay loam
56C	Nester loam, 6 to 12 percent slopes
57B	Kawkawlin loam, 1 to 4 percent slopes
58A	Wakeley-Allendale complex, 0 to 3 percent slopes
59B	Algonquin-Springport complex, 0 to 6 percent slopes
62A	Allendale loamy sand, 0 to 3 percent slopes
70	Lupton muck
71	Tawas muck
72	Dorval muck
75B	Rubicon sand, 0 to 6 percent slopes
75D	Rubicon sand, 6 to 18 percent slopes
75E	Rubicon sand, 18 to 35 percent slopes
75F	Rubicon sand, 35 to 70 percent slopes
77	Rollaway muck, frequently flooded
78	Pits, borrow
81B	Grayling sand, 0 to 6 percent slopes
81D	Grayling sand, 6 to 18 percent slopes
81E	Grayling sand, 18 to 35 percent slopes
82C	Udorthents, loamy, nearly level to gently rolling
82F	Udorthents, loamy, very steep
83B	Udipsamments, nearly level and undulating
84B	Zimmerman loamy fine sand, 0 to 6 percent slopes
86	Histosols and Aquents, ponded
93B	Tacoda Wakeley complex, 0 to 4 percent slopes
97	Colonville very fine sandy loam, occasionally flooded
100D	Curtisville sandy loam, 12 to 18 percent slopes
100E	Curtisville sandy loam, 18 to 25 percent slopes
103B	Nester sandy loam, 1 to 6 percent slopes
103C	Nester sandy loam, 6 to 12 percent slopes
108B	Selkirk loam, 0 to 4 percent slopes
114A	Ingalls sand, 0 to 3 percent slopes
120B	Morganlake sand, 0 to 6 percent slopes
120C	Morganlake sand, 6 to 12 percent slopes
123D	Klacking sand, 6 to 18 percent slopes
124	Evart sand
127	Cathro muck
128	Dawson peat
130	Grousehaven muck
159A	Finch sand, 0 to 3 percent slopes
182	Pits, quarry
197A	Gladwin loamy sand, 0 to 3 percent slopes
209B	Grayling sand, calcareous substratum, nearly level and undulating
209C	Grayling sand, calcareous substratum, rolling
209D	Grayling sand, calcareous substratum, hilly
210B	Grayling sand, nearly level and undulating
210C	Grayling sand, rolling
210D	Grayling sand, hilly
210E	Grayling sand, steep
211B	Grayling sand, banded substratum, nearly level and undulating
212B	Grayling sand, very deep water table, nearly level and undulating
213B	Graycalm sand, nearly level and undulating
214B	Typic Udipsamments, deep water table, nearly level and undulating
215B	Typic Udipsamments, loamy substratum, nearly level and undulating
216B	Typic Udipsamments, loamy calcareous substratum, nearly level and undulating
220B	Typic Udipsamments, nearly level and undulating
220D	Typic Udipsamments, hilly
220E	Typic Udipsamments, steep
221B	Typic Udipsamments, banded substratum, nearly level and undulating
221C	Typic Udipsamments, banded substratum, rolling
221D	Typic Udipsamments, banded substratum, hilly
221E	Typic Udipsamments, banded substratum, steep
222B	Typic Udipsamments, very deep water table, nearly level and undulating
223B	Graycalm-Grayling sands, nearly level and undulating
223C	Graycalm-Grayling sands, rolling
223D	Graycalm-Grayling sands, hilly

SYMBOL	NAME
223E	Graycalm-Grayling sands, steep
224B	Croswell sand, nearly level and undulating
225B	Entic Haplorthods, sandy, loamy substratum, nearly level and undulating
225C	Entic Haplorthods, sandy, loamy substratum, rolling
231D	Entic Haplorthods, sandy, banded substratum-Alfic Haplorthods, sandy, complex, hilly
231E	Entic Haplorthods, sandy, banded substratum-Alfic Haplorthods, sandy, complex, steep
232B	Entic Haplorthods, sandy-Alfic Haplorthods, sandy, complex, very deep water table, nearly level and undulating
233B	Alfic Haplorthods, sandy-Entic Haplorthods, sandy, fine-loamy banded substratum, complex, nearly level and undulating
233C	Alfic Haplorthods, sandy-Entic Haplorthods, sandy, fine-loamy banded substratum, complex, rolling
233D	Alfic Haplorthods, sandy-Entic Haplorthods, sandy, fine-loamy banded substratum, complex, hilly
235B	Alfic Haplorthods, sandy over loamy-Alfic Haplorthods, sandy, complex, nearly level and undulating
235C	Alfic Haplorthods, sandy over loamy-Alfic Haplorthods, sandy, complex, rolling
236B	Arenic Eutroboralfs, loamy, nearly level and undulating
237B	Eutroboralfs, nearly level and undulating
237D	Eutroboralfs, hilly
254A	Borosaprists, euic-Fluvaquents-Aquic Udipsamments complex, nearly level
262A	Au Gres sand, nearly level
263A	Argic Endoaquods, nearly level
264A	Allendale loamy sand, nearly level
265B	Eutroboralfs-Allendale complex, nearly level and undulating
266A	Typic Duraquods, sandy, nearly level
272	Endoaquods-Fluvaquents complex
273	Leafriver-Wakeley complex
274	Typic Endoaquods
280	Aquents and Histosols, ponded
281	Borosaprists, dysic
282	Borosaprists, euic
343	Sims loam, drained
355E	Crowell-Proper complex, 4 to 25 percent slopes
356E	Aquepts-Histosols-Fluvaquents complex, nearly level to very steep
357B	Udipsamments-Urban land complex, 0 to 8 percent slopes
360	Wakeley muck
367A	Whittemore-Springport complex, 0 to 3 percent slopes
368A	Au Gres-Deford complex, 0 to 3 percent slopes
369	Deford muck
370A	McIvor sand, 0 to 3 percent slopes
371	Springport silt loam
372B	Proper-Leafriver complex, 0 to 6 percent slopes
375	Kanotin muck
377	Wabun mucky sand
378A	Algonquin clay, 0 to 3 percent slopes
379A	Algonquin-Springport complex, 0 to 3 percent slopes
380	Access denied
381A	McIvor-Wakeley complex, 0 to 3 percent slopes
382B	Proper sand, 0 to 6 percent slopes
383B	Wurtsmith sand, 0 to 6 percent slopes
392	Caffey mucky sand
403B	Iargo silt loam, 2 to 6 percent slopes
403C	Iargo silt loam, 6 to 12 percent slopes
404A	Manary silty clay loam, 0 to 3 percent slopes
405B	Manary-Iargo complex, 0 to 6 percent slopes
406A	Winterfield loamy sand, rarely flooded, 0 to 2 percent slopes
407	Lacota loam
408	Sims loam
409A	Finch-Deford-Au Gres complex, 0 to 3 percent slopes
410B	Proper-Finch-Deford complex, 0 to 6 percent slopes
411A	Meehan sand, 0 to 3 percent slopes
425D	Hottis sandy loam, 12 to 18 percent slopes
426B	Coppler loamy sand, 0 to 6 percent slopes
426C	Coppler loamy sand, 6 to 12 percent slopes
427	Tonkey sandy loam
429D	Menominee sand, 12 to 18 percent slopes
430D	Mongo loam, 12 to 18 percent slopes
430E	Mongo loam, 18 to 35 percent slopes
431B	Skeel loamy sand, 0 to 6 percent slopes
432B	Wurtsmith-Meehan sands, 0 to 6 percent slopes
433B	Morganlake-Graycalm sands, 0 to 6 percent slopes
434D	Graycalm-Menominee-Morganlake sands, 6 to 18 percent slopes
435B	Skeel-Algonquin-Aquepts complex, 0 to 6 percent slopes
436A	Manary-Whittemore-Springport complex, 0 to 3 percent slopes
437D	Wurtsmith-Meehan-Deer Park sands, 0 to 18 percent slopes
438C	Meehan-Tawas-Wurtsmith complex, 0 to 12 percent slopes
439D	Deer Park sand, 4 to 18 percent slopes
440B	Kawkawlin-Sims complex, 0 to 4 percent slopes
441B	Morganlake-Nester complex, 0 to 6 percent slopes
441C	Morganlake-Nester complex, 6 to 12 percent slopes
442D	Menominee-Curtisville complex, 12 to 18 percent slopes
442E	Menominee-Curtisville complex, 18 to 35 percent slopes
443B	Kawkawlin-Allendale-Aquepts complex, 0 to 4 percent slopes
444B	Kawkawlin sandy loam, 0 to 4 percent slopes
445A	Corsair very fine sandy loam, 0 to 3 percent slopes
446B	Wurtsmith-Meehan-Urban land complex, 0 to 6 percent slopes
447A	Whittemore sand, 0 to 3 percent slopes
448A	Meehan-Tawas complex, 0 to 3 percent slopes
449A	Kokosing sand, 0 to 3 percent slopes
W	Water

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Field sheet matchline and neatline

AD HOC BOUNDARY (label)

- Small airport, or cemetery

STATE COORDINATE TICK
1 890 000 FEET

ROADS

- Divided (median shown if scale permits)
- County, farm, or ranch

ROAD EMBLEM & DESIGNATIONS

- Federal 287
- State 52
- Other (Adams Road) 1283

RAILROAD

DAMS

- Large (to scale)
- Medium or Small (Named where applicable) Water

PITS

- Gravel pit
- Mine or quarry

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end

Canals or ditches

- Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS 16B 16D

ESCARPMENTS

- Other than bedrock (points down slope)

SHORT STEEP SLOPE

DEPRESSION OR SINK

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Dumps and other similar non soil areas
- Sandy spot
- Severely eroded spot
- Stony spot, very stony spot
- Areas of mineral soil in muck
- Areas that have gravel strata in the subsoil
- Barrow pit (Areas in which materials other than gravel are being excavated.)
- Bedrock at less than 20 inches from the surface
- Bogs (Small areas of acid or dysic organics
- Cut and fill
- Landfill
- Limestone sinkhole (differs from dry depression)
- Loamy spot in a sandy area
- Loam material between 20 and 60 inches in a sandy area
- Marl spot
- Muck spot (organic spot)
- Tufa spot

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986-1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

IOSCO COUNTY, MICHIGAN NO. 1

2

N

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840

IOSCO COUNTY, MICHIGAN NO. 2

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986 - 1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

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IOSCO COUNTY, MICHIGAN NO. 3

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

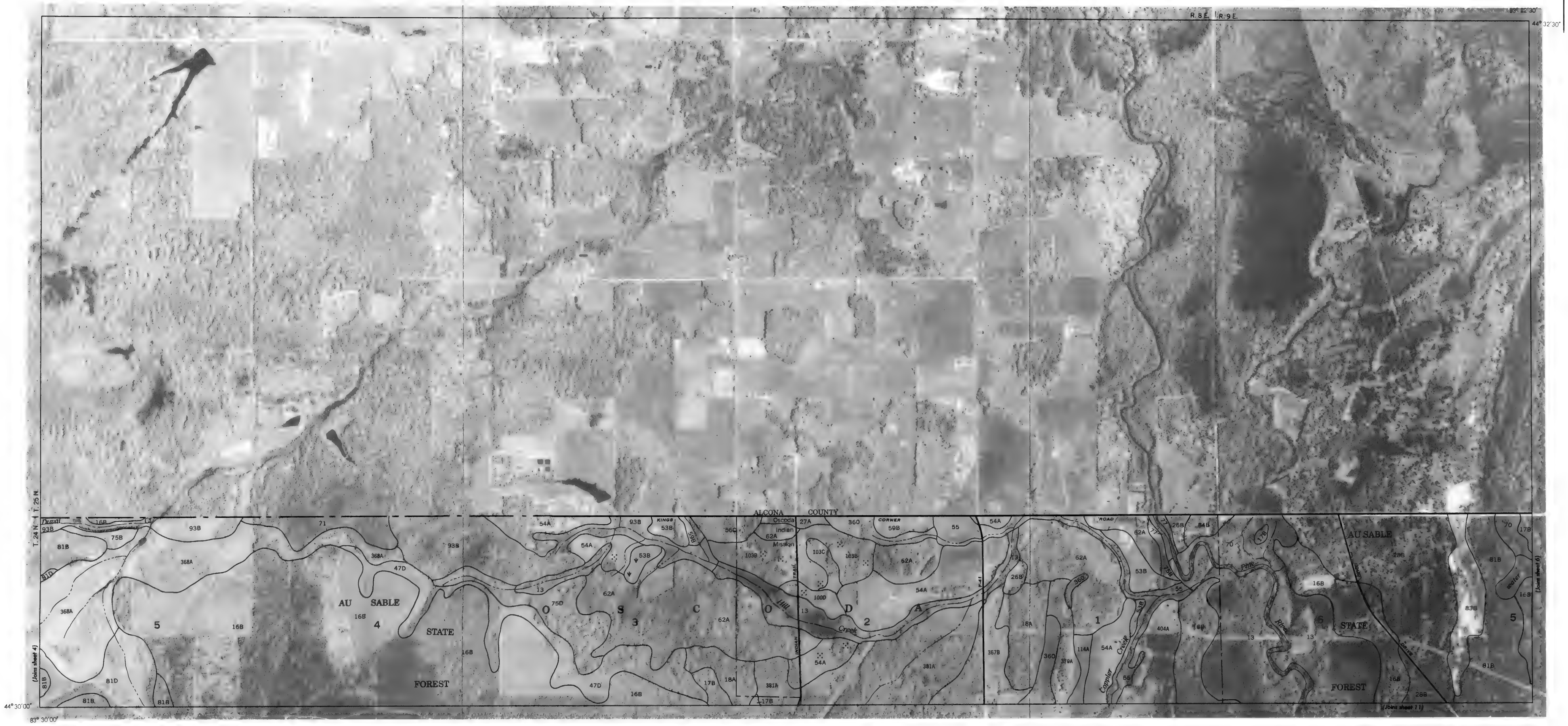
SCALE 1:15 840

IOSCO COUNTY, MICHIGAN NO. 4

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986-1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

5

N



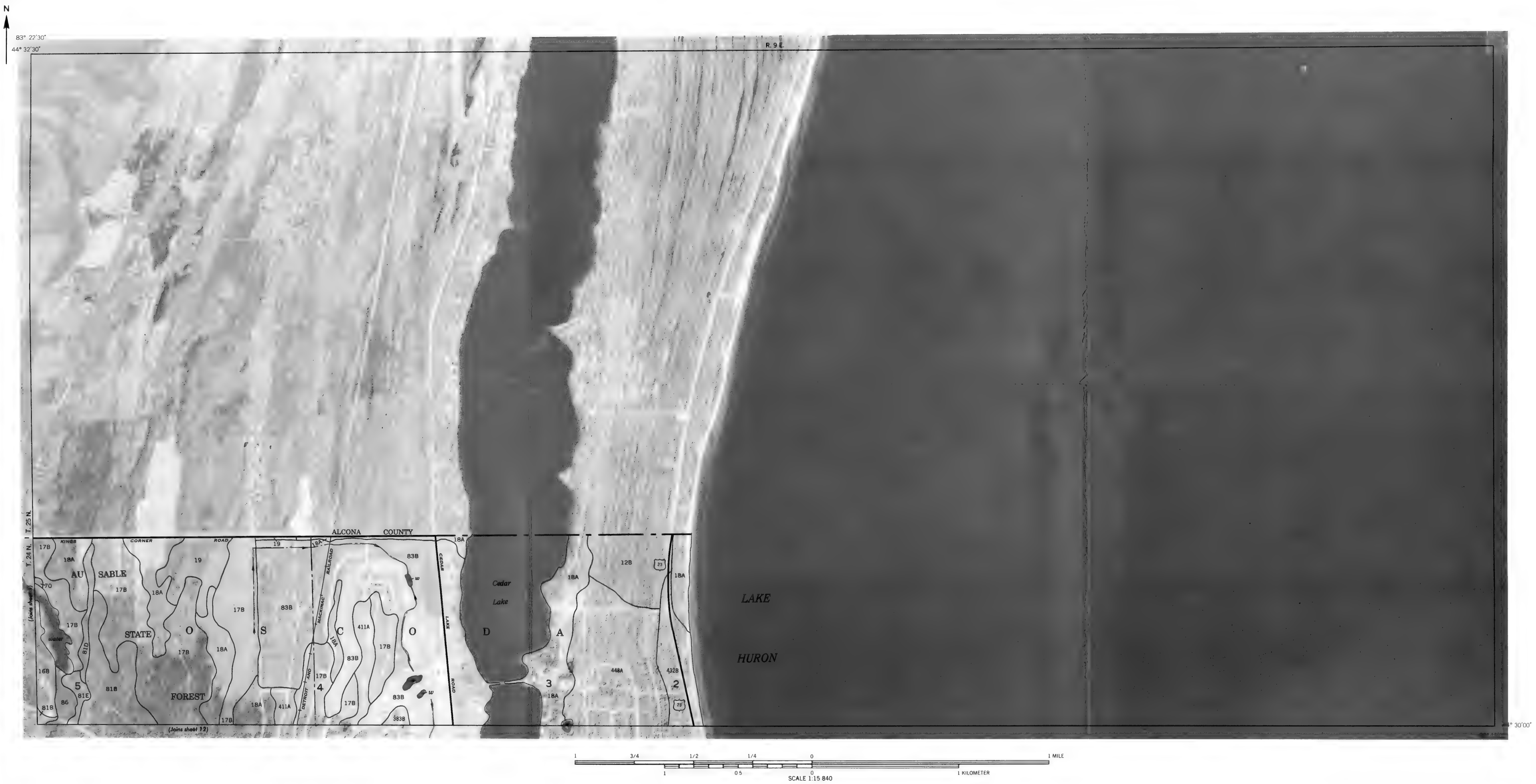
1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared from 1986 - 1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

IOSCO COUNTY, MICHIGAN NO. 5



IOSCO COUNTY, MICHIGAN NO. 6

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986-1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

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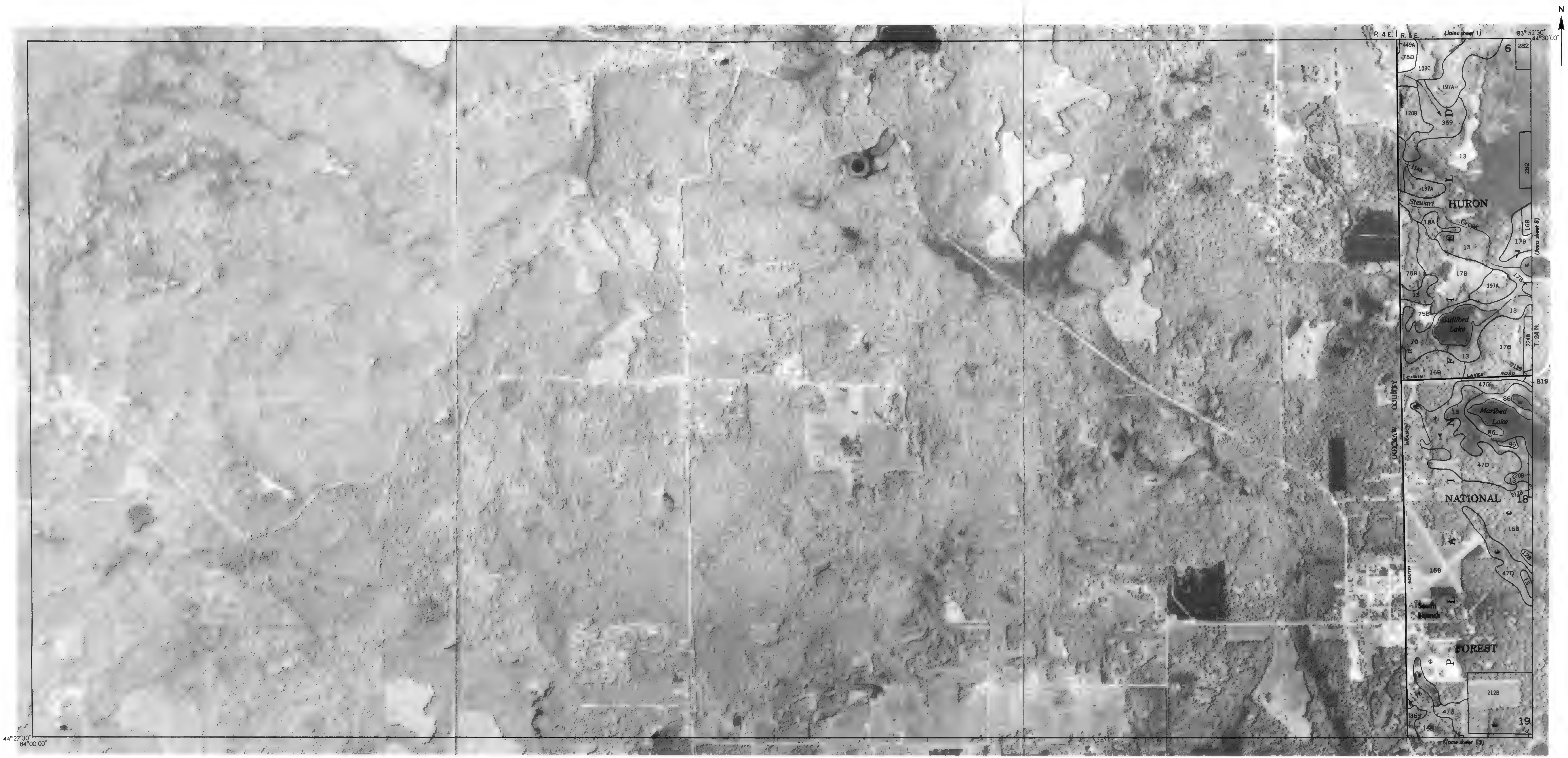
IOSCO COUNTY, MICHIGAN NO. 7



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840

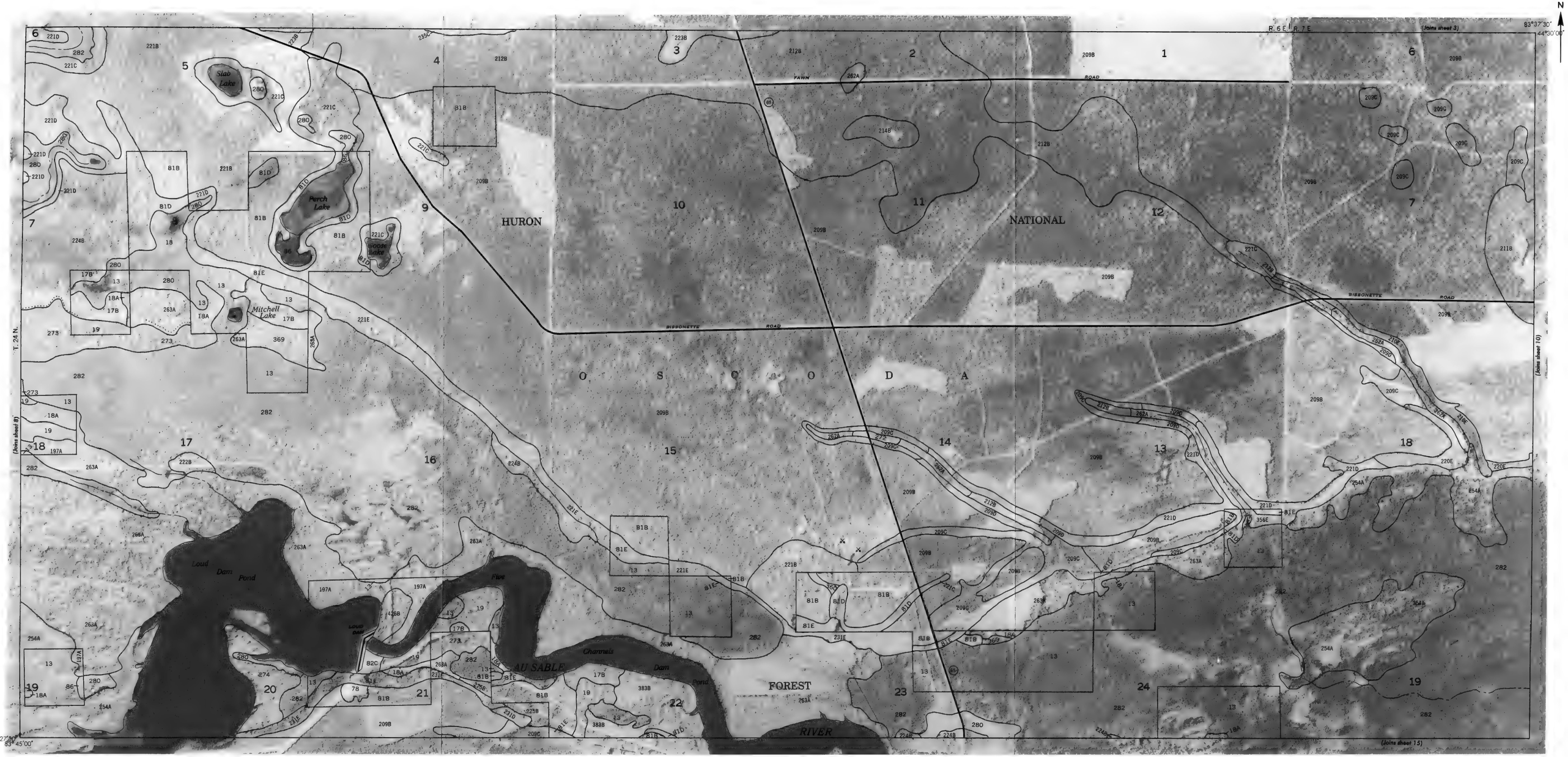
1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840

IOSCO COUNTY, MICHIGAN NO. 8

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986-1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



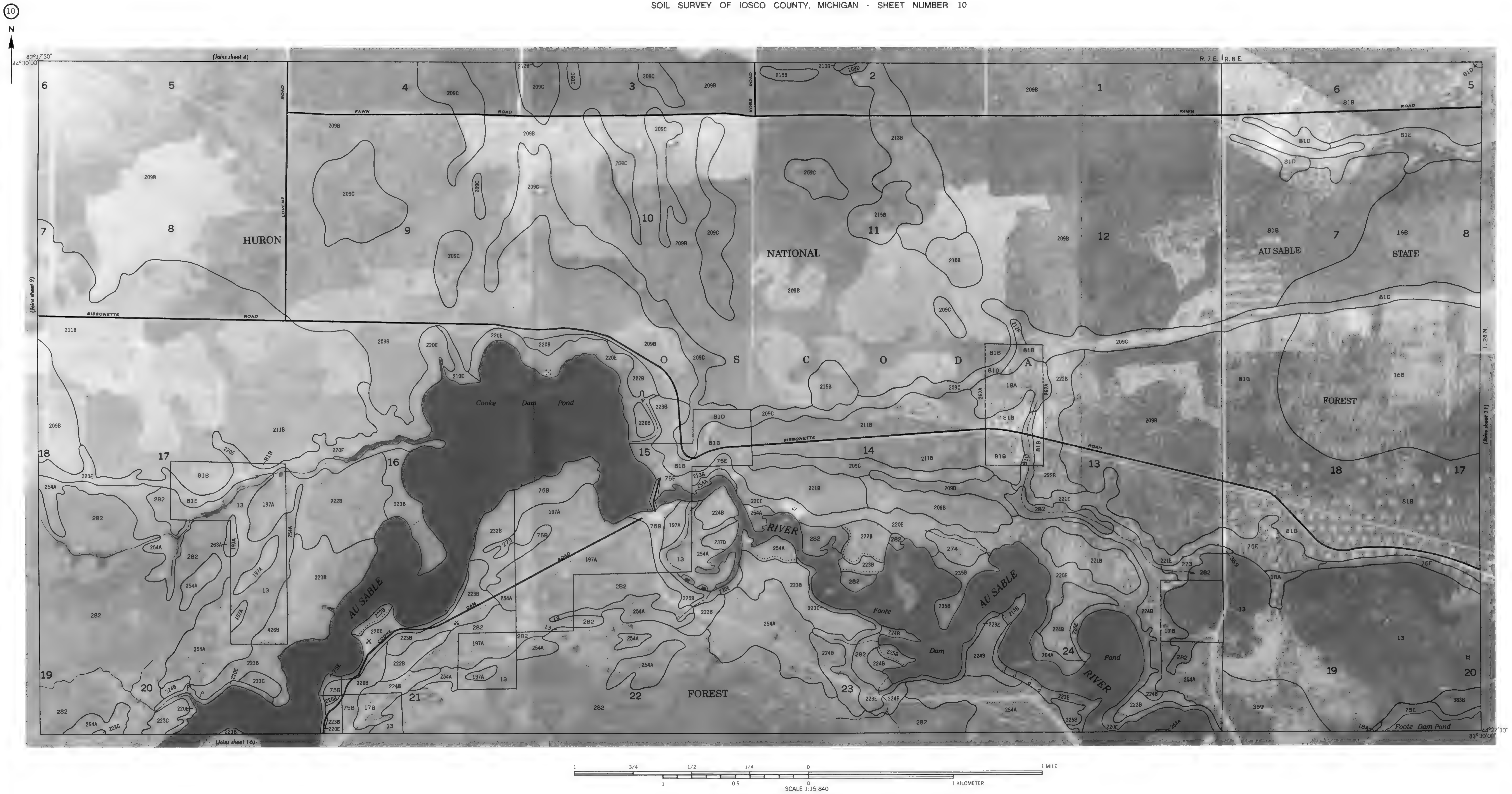
1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986–1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

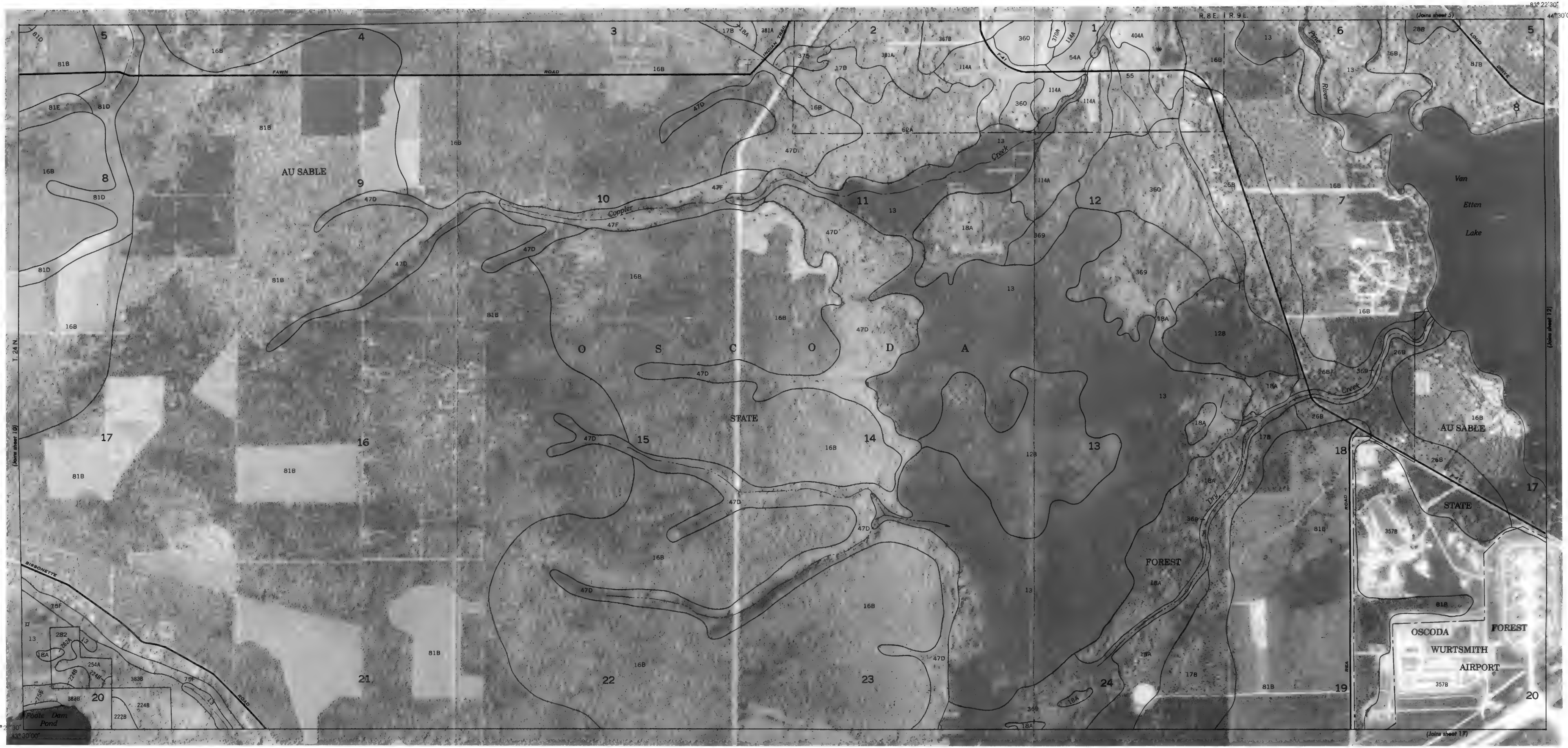
IOSCO COUNTY, MICHIGAN NO. 9



IOSCO COUNTY, MICHIGAN NO. 10

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986-1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

11



1 — 3/4 — 1/2 — 1/4 — 0 — 1 MILE

1 — 0.5 — 0 — 1 KILOMETER

SCALE 1:15 840

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986 - 1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

IOSCO COUNTY, MICHIGAN NO. 11

12

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840

IOSCO COUNTY, MICHIGAN NO. 12

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986–1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

13

N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1981-1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

IOSCO COUNTY, MICHIGAN NO. 13

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840

IOSCO COUNTY, MICHIGAN NO. 14

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986-1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986-1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 MILE
1 KILOMETER
SCALE 1:15 840

IOSCO COUNTY, MICHIGAN NO. 16

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986-1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

17

N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986–1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

IOSCO COUNTY, MICHIGAN NO. 17

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840

18

N

SCALE 1:15 840

1 MILE

1 KILOMETER

IOSCO COUNTY, MICHIGAN NO. 18

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986-1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986–1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

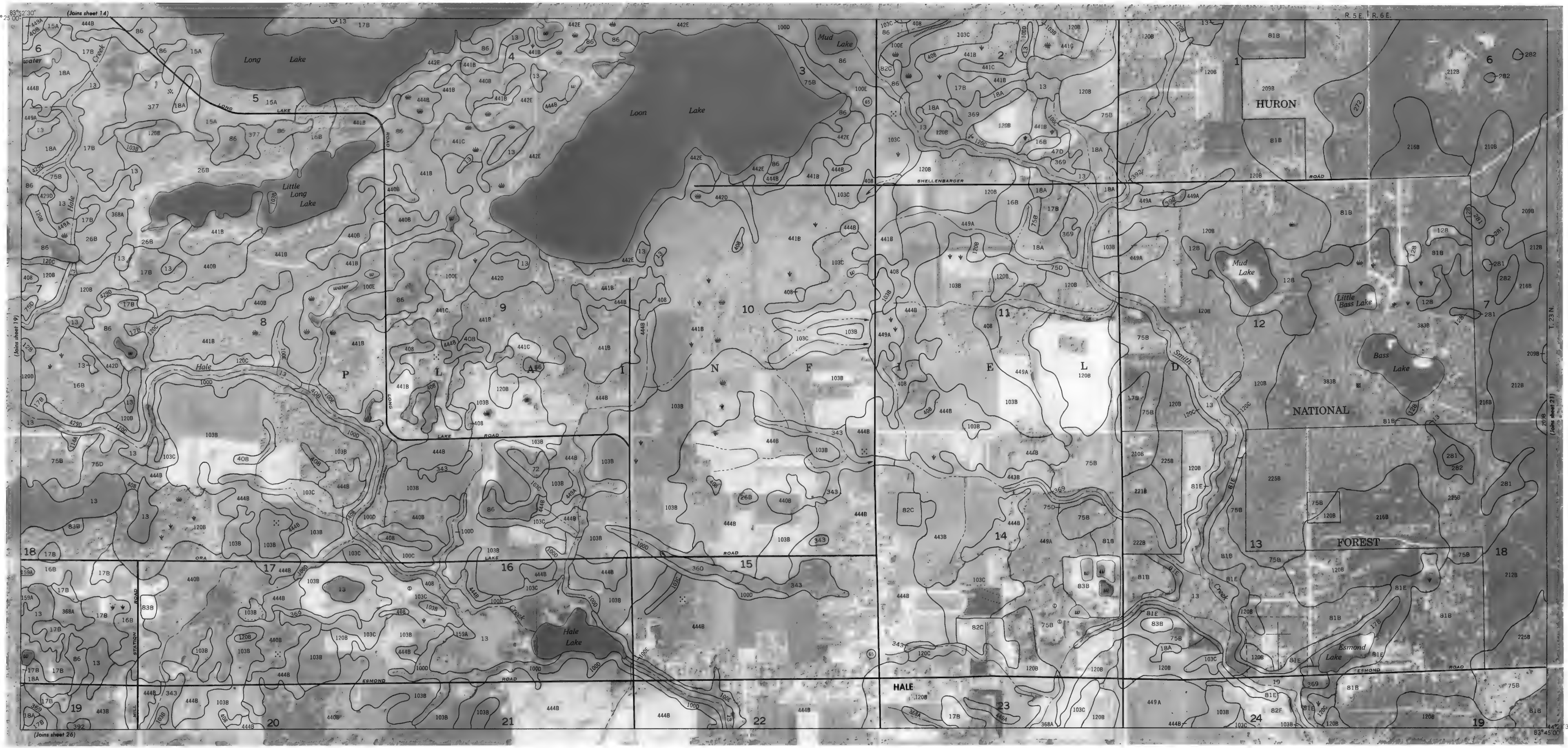
IOSCO COUNTY, MICHIGAN NO. 19

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840

SOIL SURVEY OF IOSCO COUNTY, MICHIGAN - SHEET NUMBER 20



1 | 3/4 | 1/2 | 1/4 | 0 | 1 MILE

1 | 0.5 | 0 | 1 KILOMETER

SCALE 1:15 840

IOSCO COUNTY, MICHIGAN NO. 20

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986–1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

IOSCO COUNTY, MICHIGAN NO. 21

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840

SOIL SURVEY OF IOSCO COUNTY, MICHIGAN - SHEET NUMBER 22

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840

IOSCO COUNTY, MICHIGAN NO. 22

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986-1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

23

N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986-1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

IOSCO COUNTY, MICHIGAN NO. 23

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

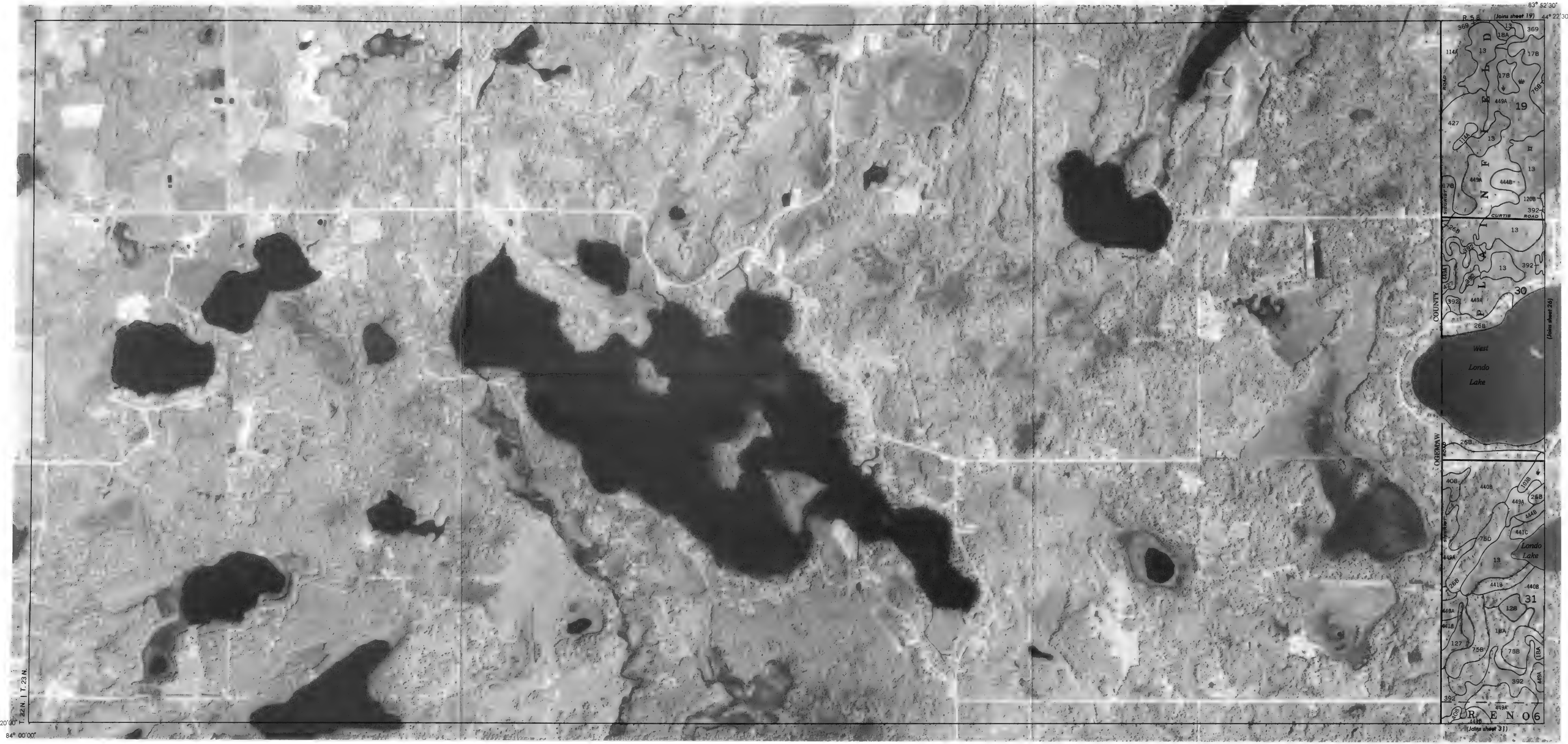
SCALE 1:15 840

IOSCO COUNTY, MICHIGAN NO. 24

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986-1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

25

N



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986-1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

IOSCO COUNTY, MICHIGAN NO. 25

1 MILE 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840

IOSCO COUNTY, MICHIGAN NO. 26

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986-1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

27

N

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986–1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

IOSCO COUNTY, MICHIGAN NO. 28

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986–1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

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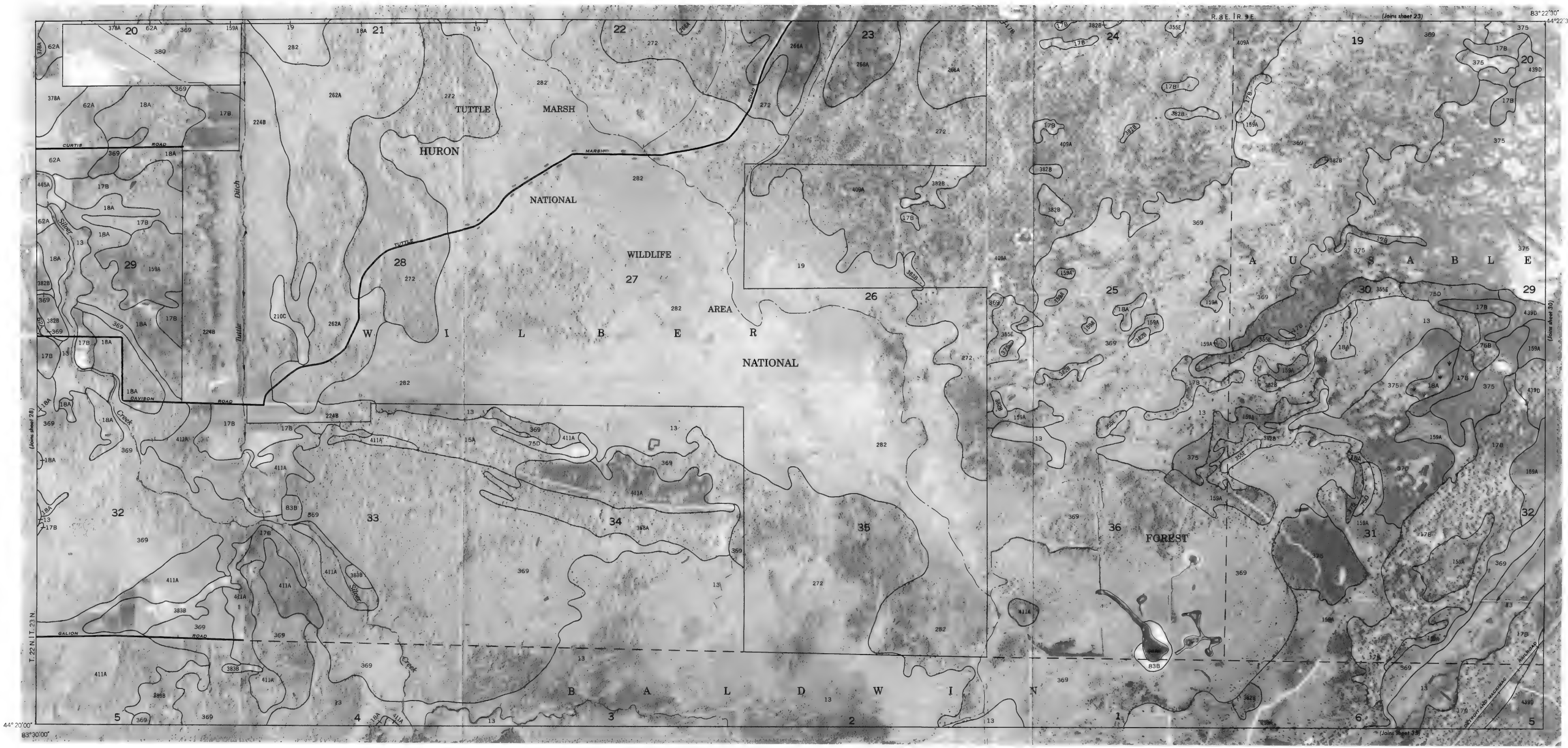
IOSCO COUNTY, MICHIGAN NO. 29



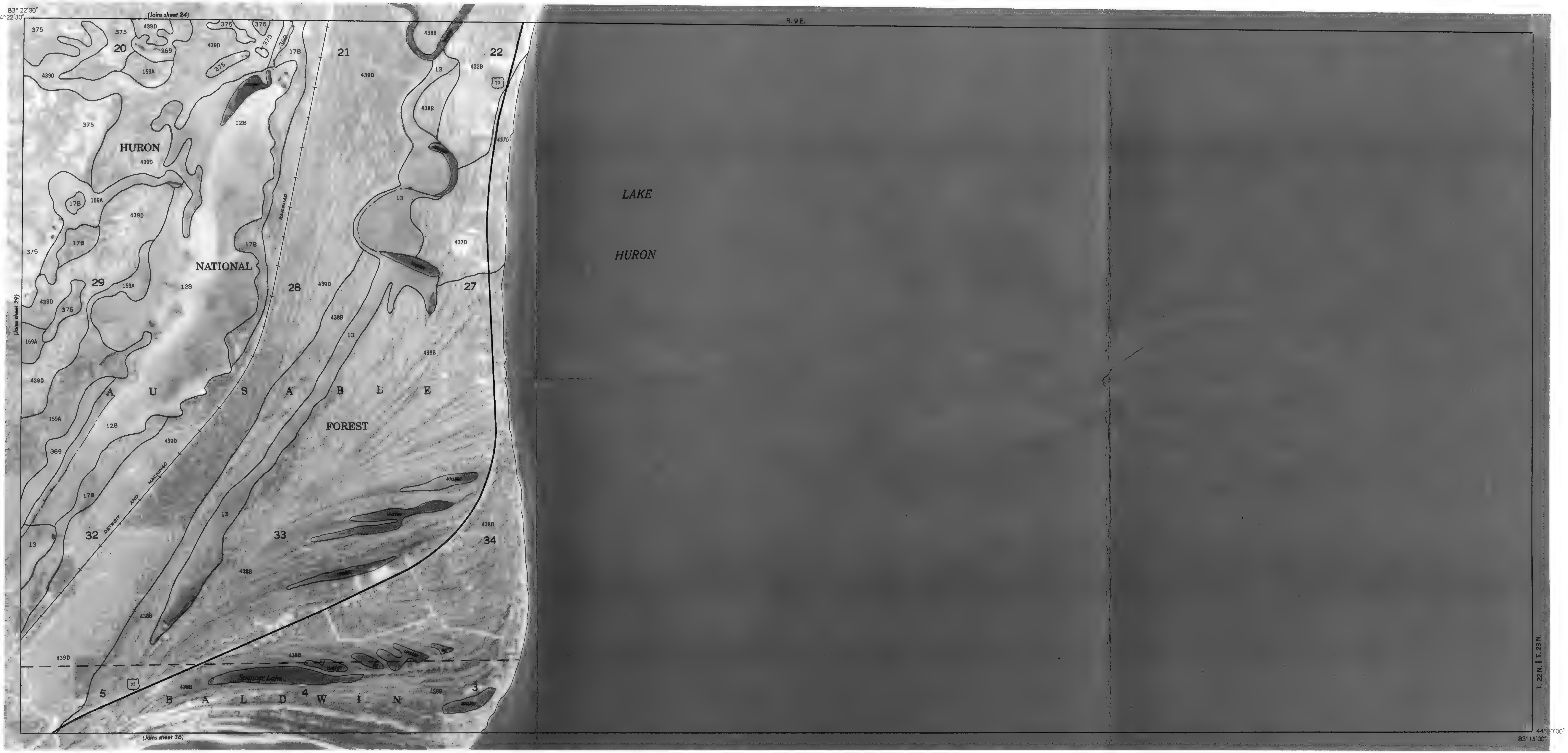
1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840

30

N



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840

IOSCO COUNTY, MICHIGAN NO. 30

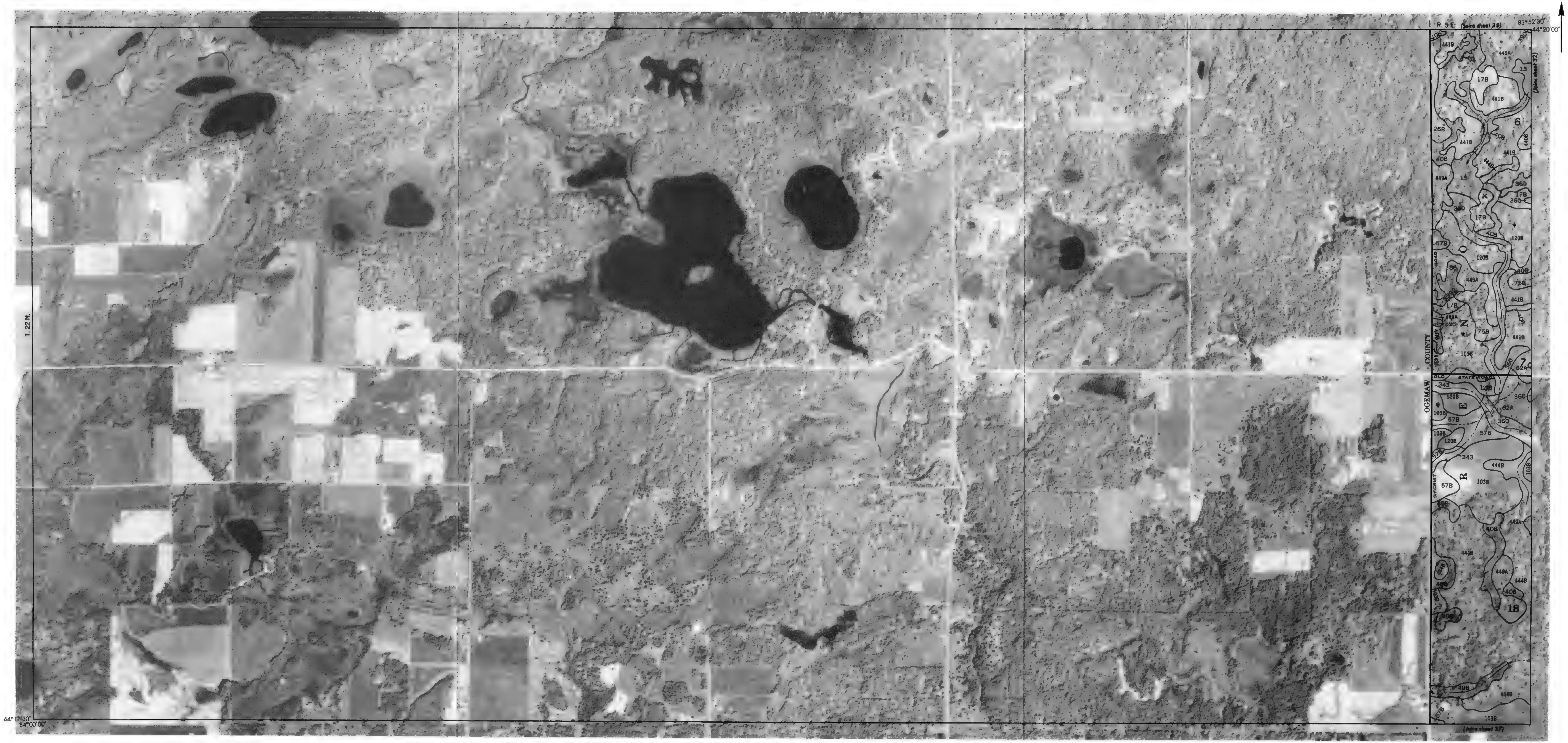
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986-1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

31

N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986 - 1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

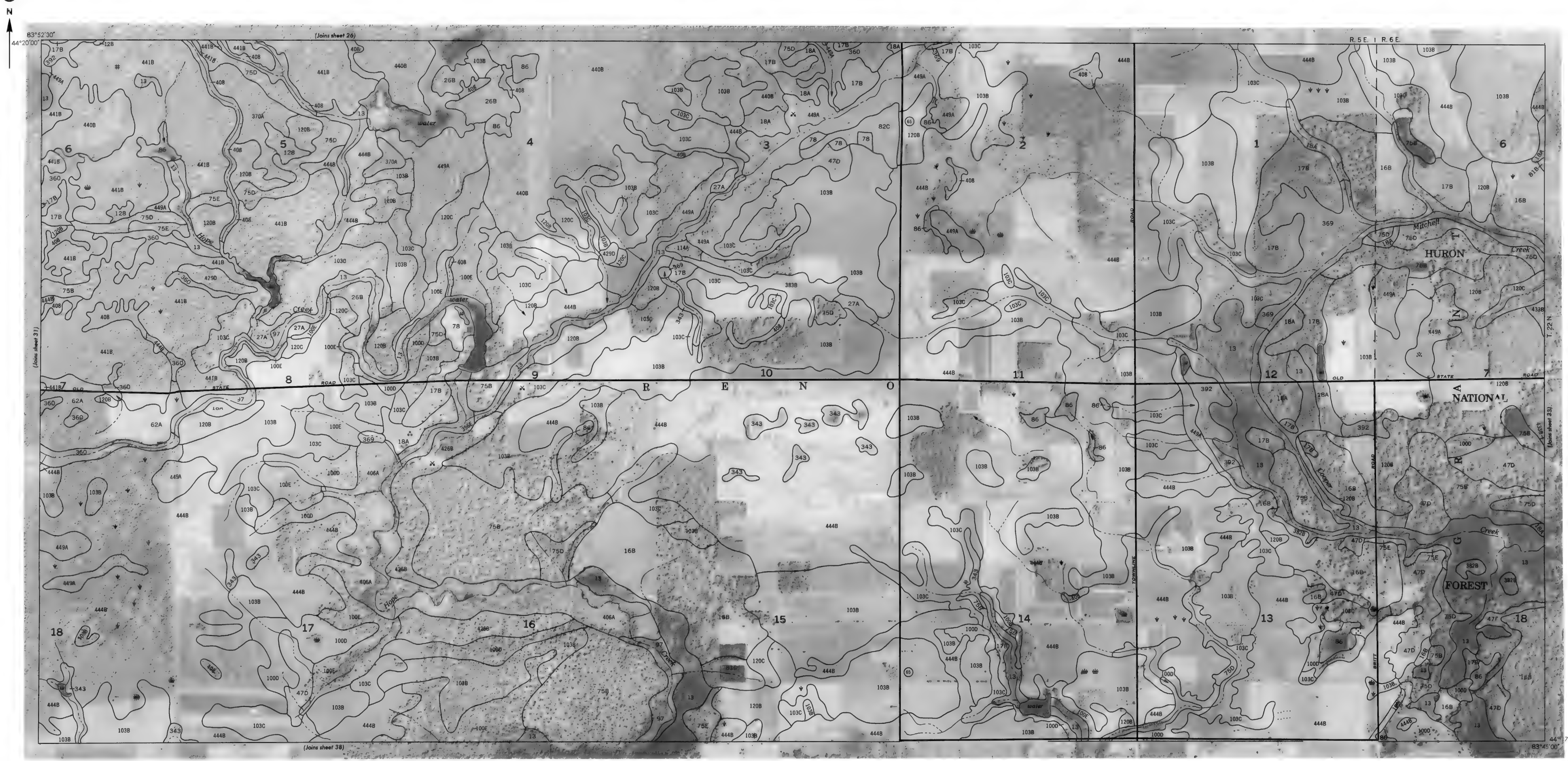
IOSCO COUNTY, MICHIGAN NO. 31



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840

IOSCO COUNTY, MICHIGAN NO. 32

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986 - 1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

33

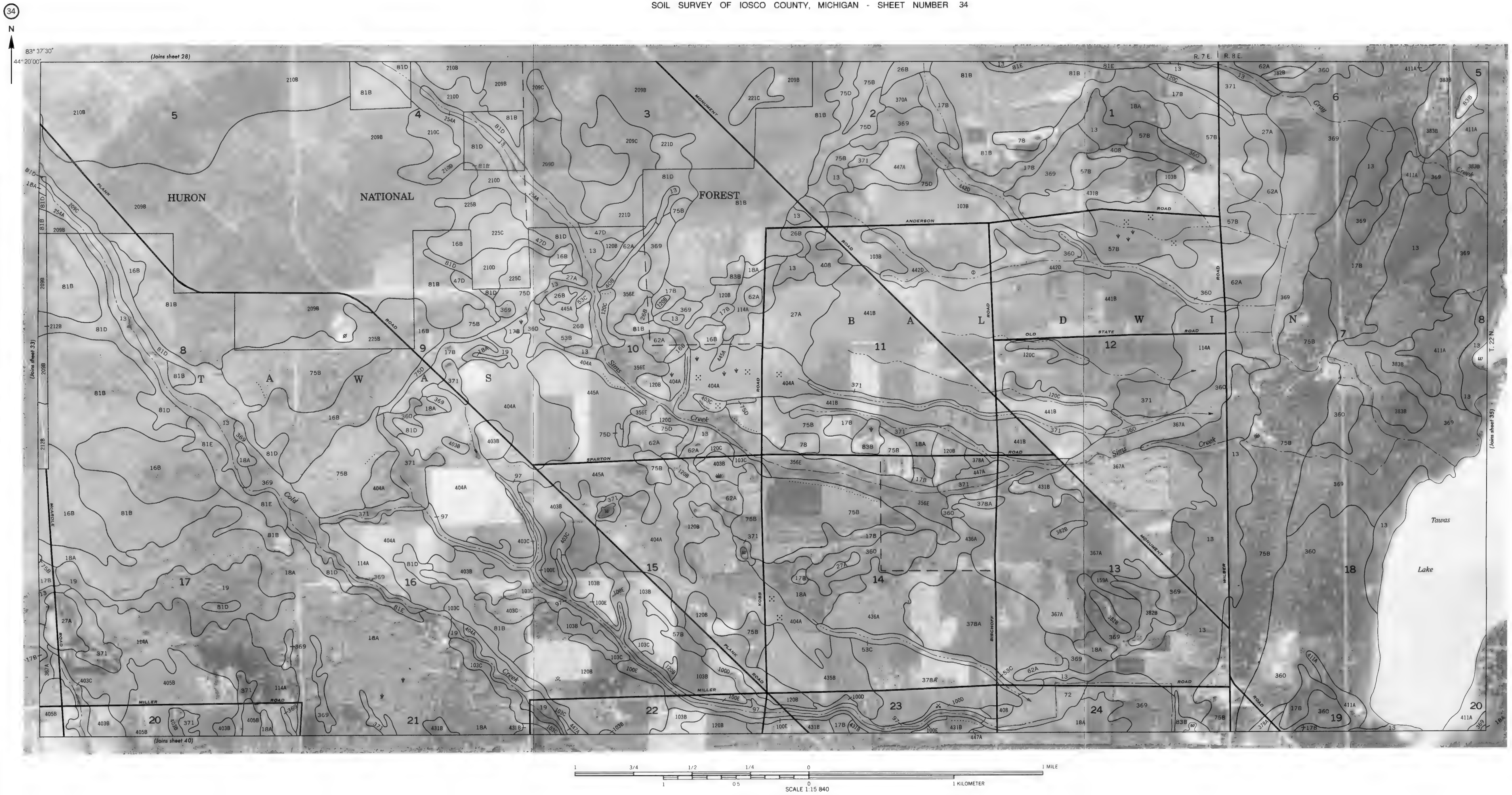
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986-1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

IOSCO COUNTY, MICHIGAN NO. 33

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840



IOSCO COUNTY, MICHIGAN NO. 34

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986-1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

35

N

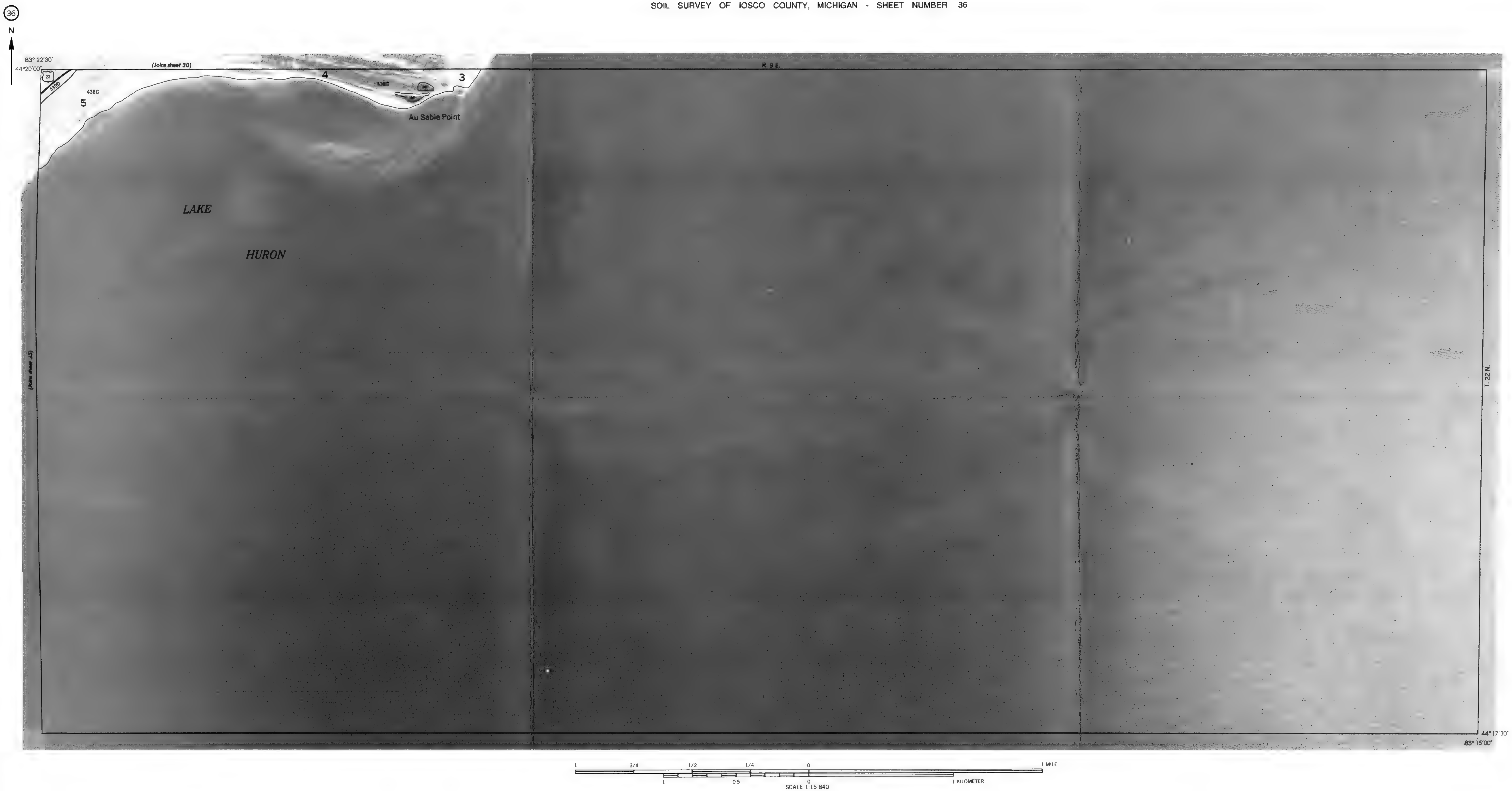
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986-1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

IOSCO COUNTY, MICHIGAN NO. 35

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840



IOSCO COUNTY, MICHIGAN NO. 36

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986 - 1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

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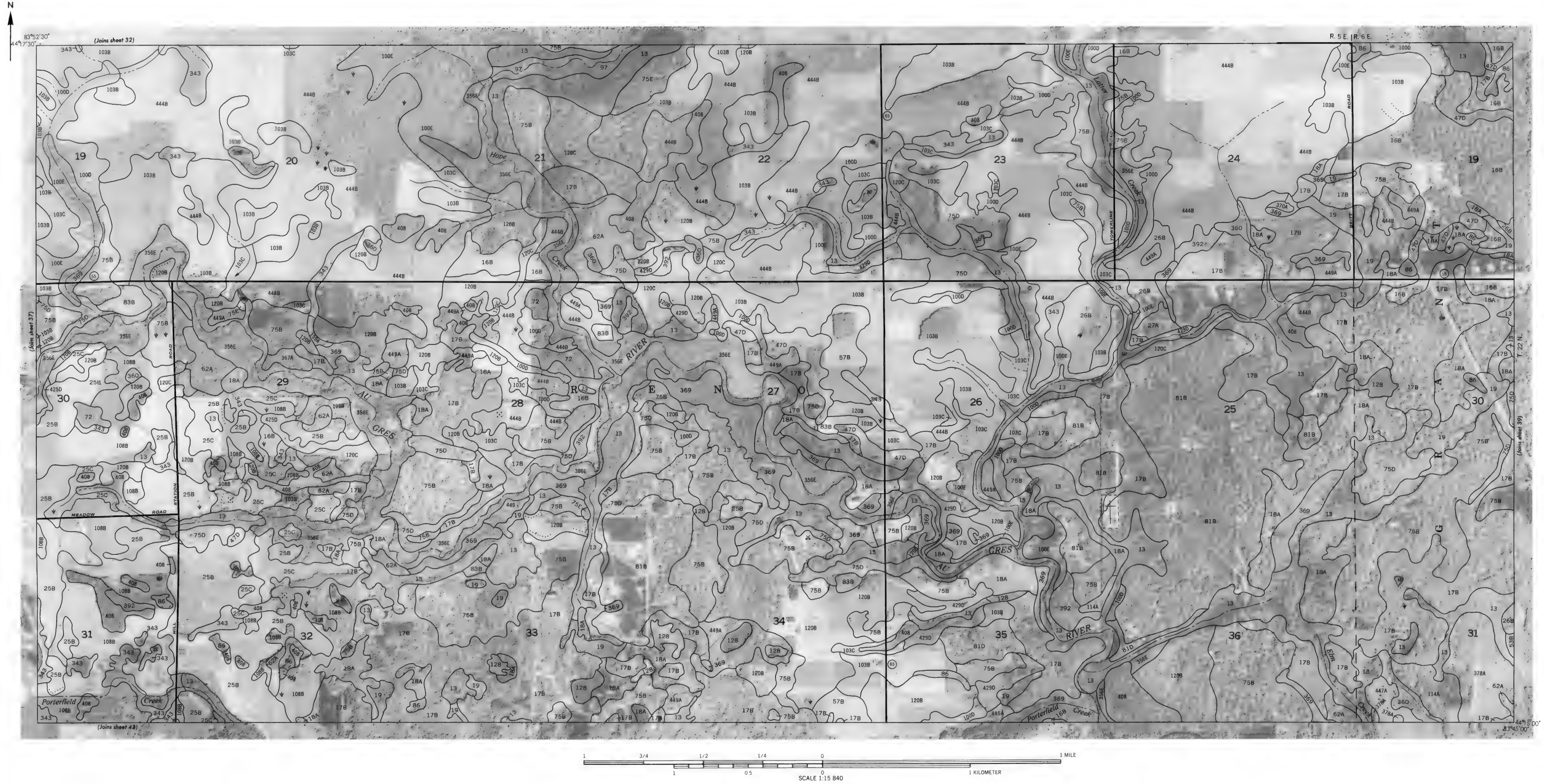
IOSCO COUNTY, MICHIGAN NO. 37

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840



IOSCO COUNTY, MICHIGAN NO. 38

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986-1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

39

N

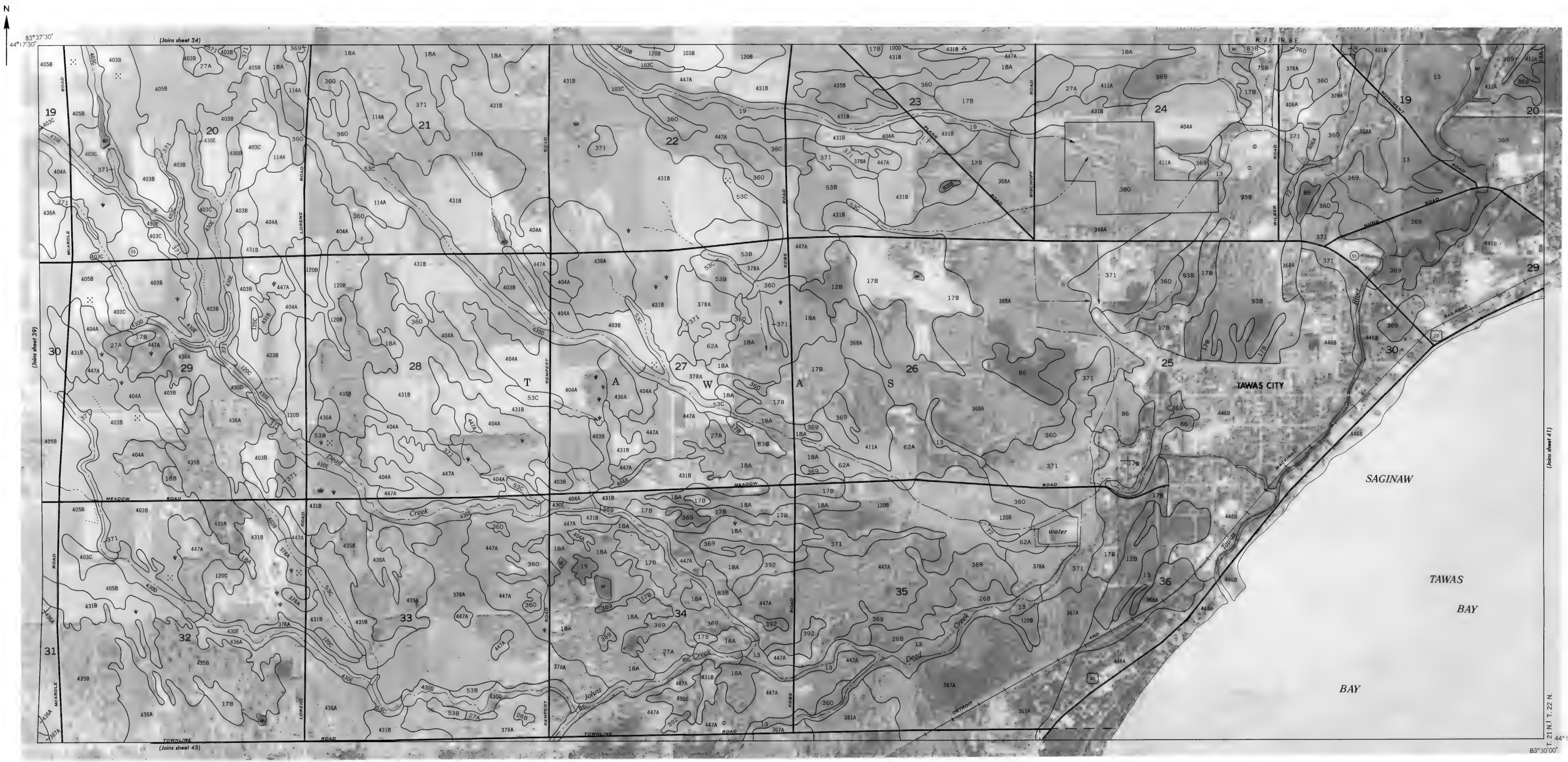
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986-1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

IOSCO COUNTY, MICHIGAN NO. 39

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

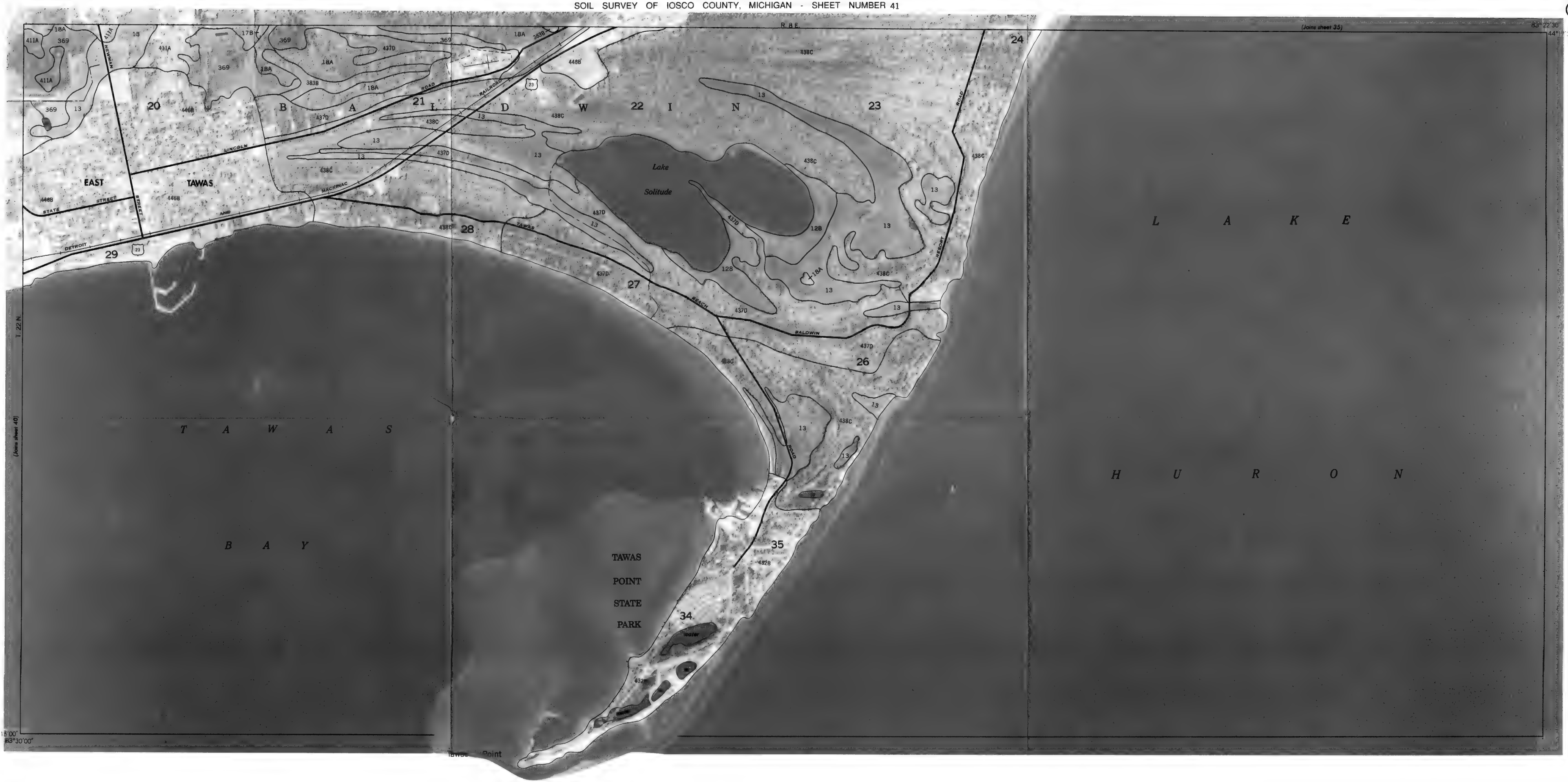
SCALE 1:15 840



1 MILE
SCALE 1:15 840
1 KILOMETER

IOSCO COUNTY, MICHIGAN NO. 40

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986–1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986-1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

IOSCO COUNTY, MICHIGAN NO. 41

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840

IOSCO COUNTY, MICHIGAN NO. 42

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986 - 1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

IOSCO COUNTY, MICHIGAN NO. 43

44

N

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840

IOSCO COUNTY, MICHIGAN NO. 44

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986-1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

45

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986-1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

IOSCO COUNTY, MICHIGAN NO. 45

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

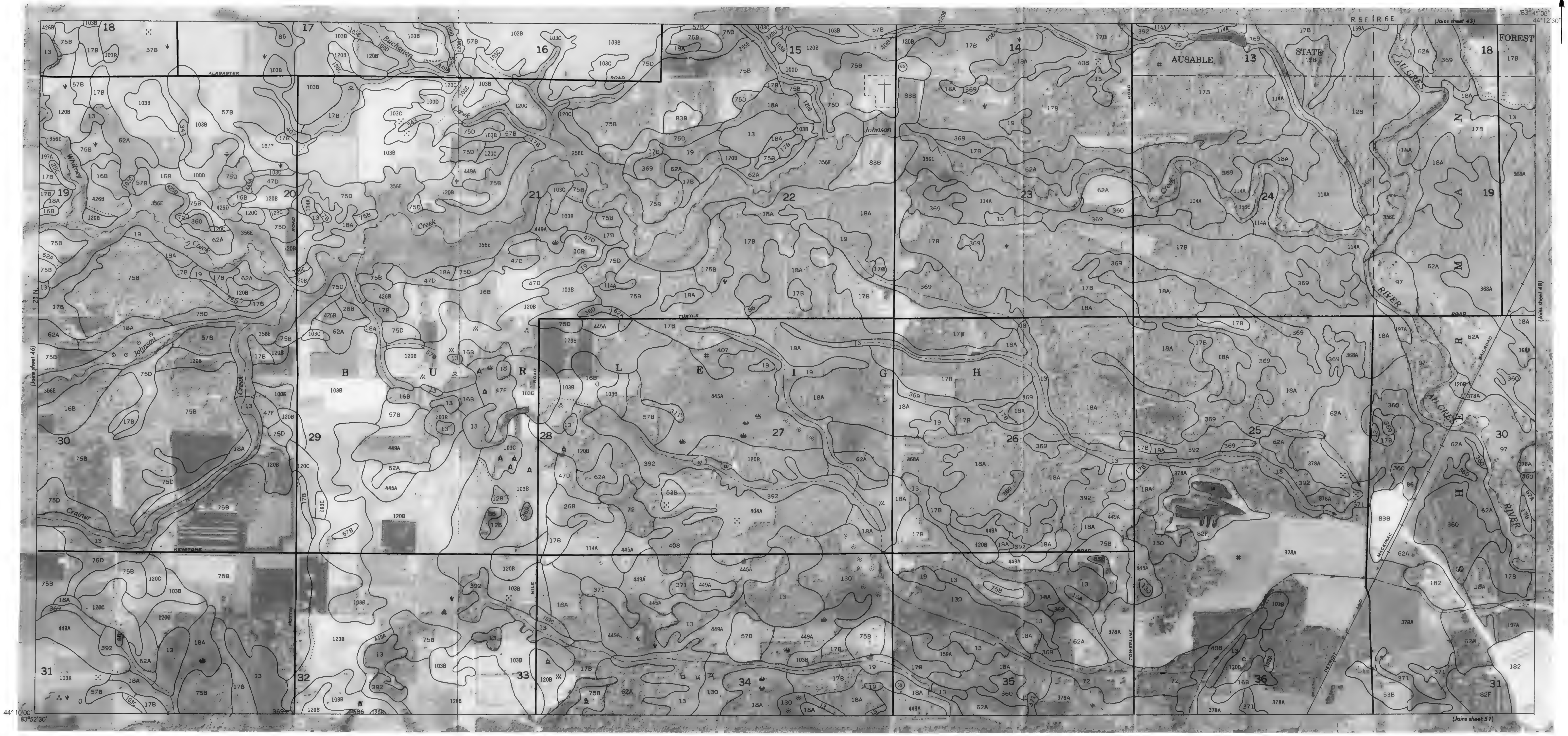
SCALE 1:15 840

SOIL SURVEY OF IOSCO COUNTY, MICHIGAN - SHEET NUMBER 46

1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:15 840

IOSCO COUNTY, MICHIGAN NO. 46

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986-1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared from 1966-1968 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

IOSCO COUNTY, MICHIGAN NO. 47

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840

SOIL SURVEY OF IOSCO COUNTY, MICHIGAN - SHEET NUMBER 48

IOSCO COUNTY, MICHIGAN NO. 48

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986-1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

49

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986-1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

IOSCO COUNTY, MICHIGAN NO. 49

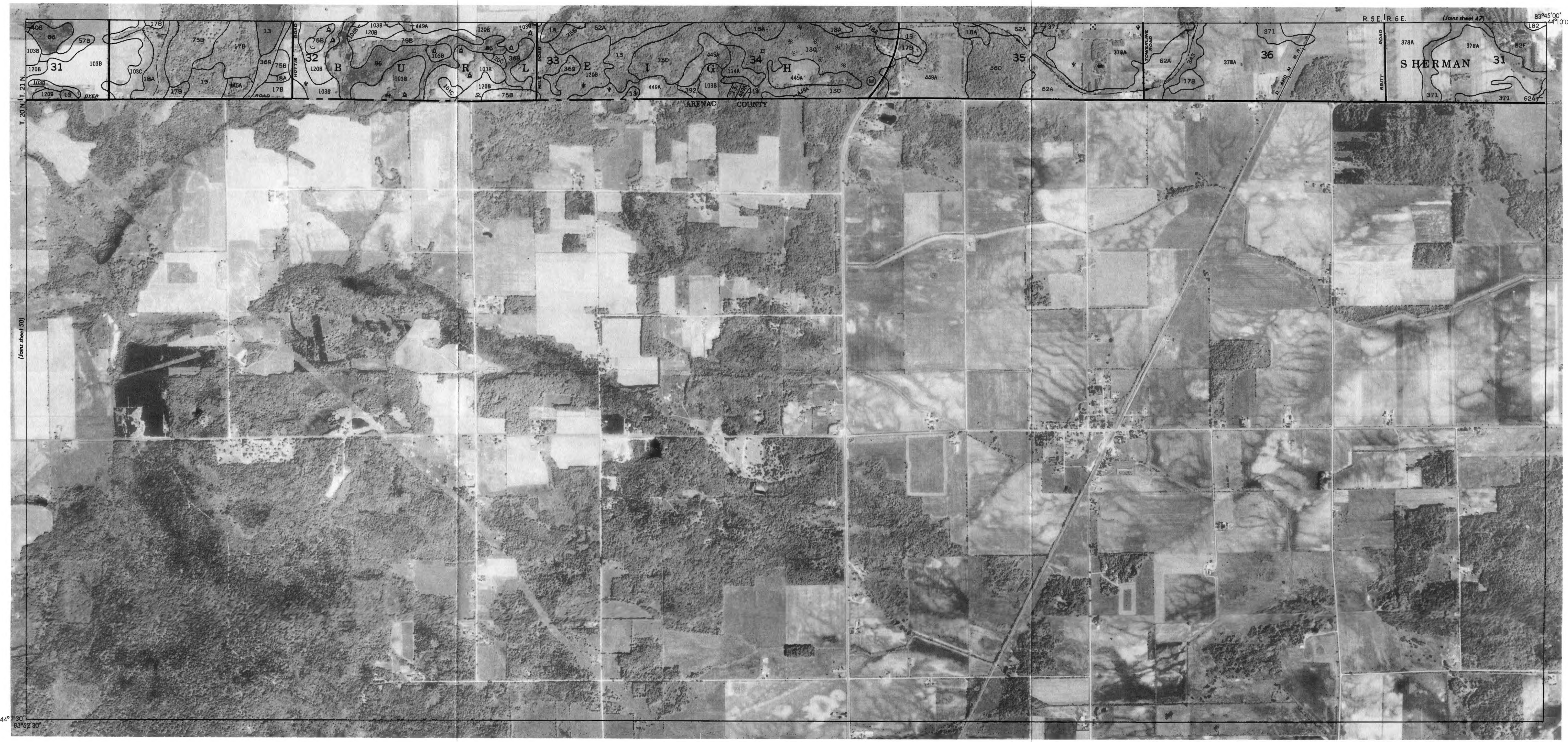
IOSCO COUNTY, MICHIGAN NO. 50

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986 - 1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986-1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

IOSCO COUNTY, MICHIGAN NO. 51



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840

SOIL SURVEY OF IOSCO COUNTY, MICHIGAN - SHEET NUMBER 52

IOSCO COUNTY, MICHIGAN NO. 52

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986-1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

53

N

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:15 840

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1986 - 1988 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

IOSCO COUNTY, MICHIGAN NO. 53